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Machine Shop
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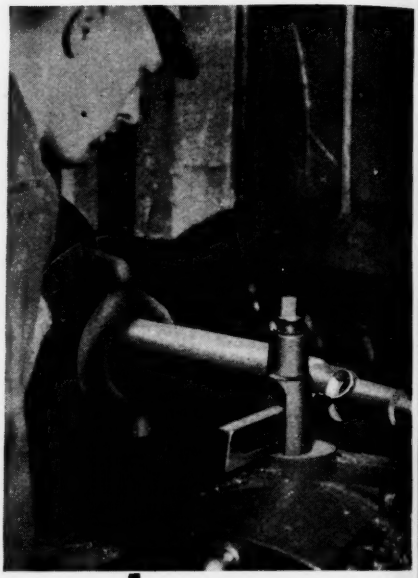

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MODERN Machine Shop

MARCH, 1930

CINCINNATI, OHIO VOL. 2, NO. 10

Casting Driving Box Liners at the Big Four Shops

By AUGUST JACOB

ONE of the more interesting departments of the C. C. C. & St. L. Railway shops at Beech Grove, Indiana, is the brass foundry. A complete section of the main building is set aside for this purpose, in which two oil-burning furnaces and the other necessary equipment has been installed. The principal functions of the department are the casting of hub liners on driving boxes, also shoe and wedge liners, gibs for lift shaft boxes,

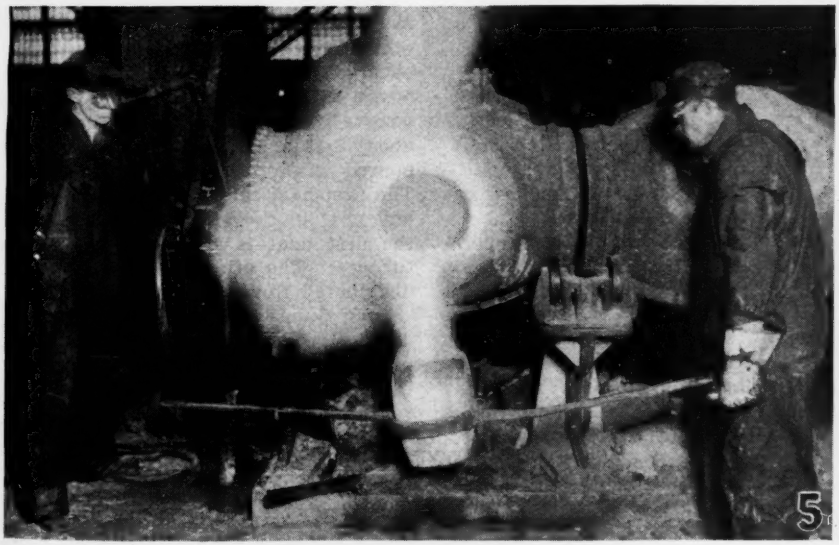


Fig. 5—Drawing off the metal preparatory to pouring.

Fig. 1—Leveling the driving boxes so that the liners will be of even thickness. Fig. 2—These boxes are ready to pour. Note the end-pieces, held in place by a steel spring, and the gage which tells when the metal is high enough.

engine truck boxes, and trailer boxes.

The furnace used for melting the metal is a "Monarch-Rockwell" with a double chamber, the furnace being so designed that either chamber can be used as a single unit or so that both chambers can be used at the same time. In the latter case, the heat from one chamber passes through the other and heats the metal in the second chamber to a high temperature at no extra cost for fuel. The chambers are mounted so that each can be revolved independently by means of a worm gear and hand wheel.

One furnace is maintained in operation daily, the other being held in reserve for use when the first needs repairs or cleaning. The fuel used is crude oil, which is drawn from a tank that is located in the ground outside the building, as required by the state laws. Air is piped to the furnaces to provide the necessary pressure of 12 to 14 ounces which is required for the efficient operation of the burners.

The metal used for liners consists almost entirely of scrap brass, which is sent to this shop from all points on the road. This scrap is made up of old hub, shoe and wedge liners, crown brasses, and so on. When casting liners on driving boxes, 14 boxes are usually poured at a heat, which is about all that can be handled conveniently. Four heats are taken off each day, when there are enough boxes on hand, making a total of 56 boxes. The furnace is usually fired at about 8:15 a. m., and the first heat is poured at approximately 10 o'clock. The first heat takes about a half hour longer than the subsequent heats, as the first heat is started with a cold furnace. The other heats are evenly distributed throughout the day.

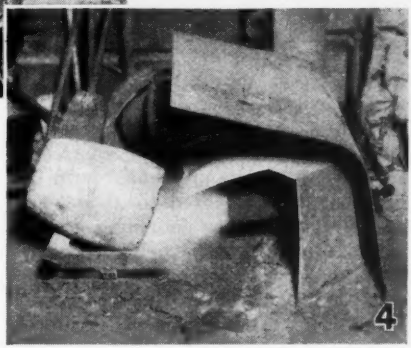
In making ready to cast liners on driving boxes, which is the most important task of this department, the boxes are arranged in two rows of seven each, with the boxes parallel with the rows. After arranging in position, each box is leveled so that the metal will flow evenly and the liner will be of uniform thickness. The leveling is done with the aid of a small level, which is set on the ma-

chined edge of the box as shown in Fig. 1. A pinch bar is used to raise the low end or corner of the box to the necessary height, then wooden wedges are placed under the box to hold it in position. In this illustration the operator is shown in the act of slipping a wedge under the end of the box, meanwhile watching the gauge. The level is tried both parallel and crosswise of the box before the box is left.

Fig. 3—Boxes ready for new hub liners. A steel ring, two sheet metal plates, and some asbestos paste aid in forming the mold. Fig. 4—The ladle is heated before using.

After all the boxes have been leveled, the ends of the shoe and wedge fits are closed with square pieces of sheet steel of 16 gauge thickness and approximately 8 inches square. These pieces are held in position against the ends of the boxes by means of springs, as shown in Fig. 2. The springs are made of $\frac{1}{8}$ in. steel rod, bent to the shape shown in the illustration. The next step in the operation consists of sealing the cracks, where the flat end-pieces fit against the ends of the boxes, with a paste made of ground asbestos boiler lagging and water. The paste is pressed into the crack with the fingers, in much the same way that putty is packed around the edge of a window-pane. A plug which consists of an old bolt that has been ground to a taper is now inserted into the oil hole, as shown, and the box is ready for pouring.

Just before pouring, however, a gauge, made of heavy steel, and with a ring in the top so that it can be lifted with a small hook, is set on the surface that is to be filled with brass, to enable the operators to obtain the correct thickness of $\frac{7}{8}$ in. The gauge is made with four legs so that the molten metal can run under it.



In arranging the boxes to pour hub liners, the boxes are set in a row as shown in Fig. 3, and a ring, the inside diameter of which is the same as the outside diameter of a hub liner, is set on the box as shown. Here again the square pieces of sheet steel are used to prevent the molten metal from running out while it is being poured, the pieces being held in place by

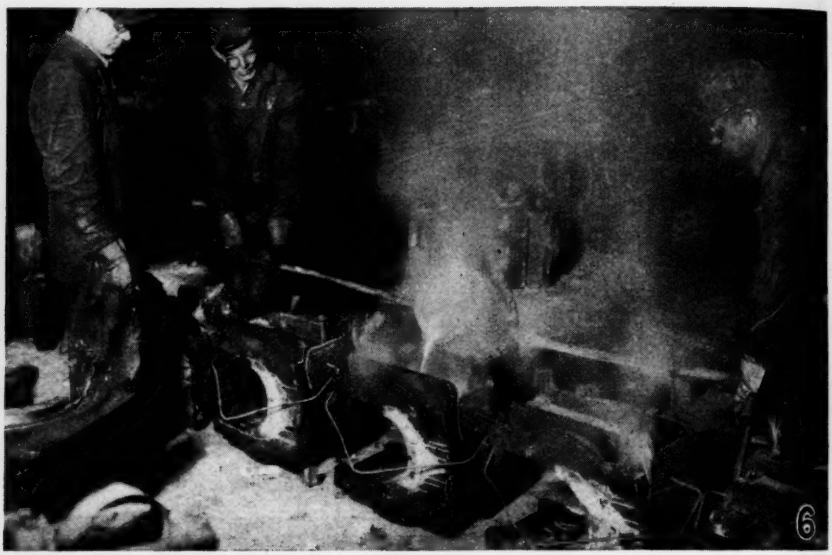


Fig. 6—The casting operation in process.

springs of heavy steel wire, formed to the shape shown in the illustration. After placing the ring and squares in position, all cracks are sealed with the asbestos paste referred to above, and the box is ready for pouring.

Before pouring, the ladle is heated by placing it in front of a retort which consists of a Bunsen burner through which a mixture of crude oil and air are forced, with the open end of the ladle toward the flame. A view of the ladle in process of heating is shown in Fig. 4. This heating process serves the double purpose of cleaning the ladle by melting any metal which may have been left in the ladle and allowing it to run out, and also to heat the ladle to such a point that it will help to hold the heat in the metal while pouring.

With the boxes properly arranged and sealed, and the ladle hot, the job is ready for pouring. The operation of drawing off the metal into the ladle is shown in Fig. 5, at the head of this article. Figure 6 shows the pouring operation in process. Two men handle the ladle while a helper stands ready with a hook, and as soon as the hot metal is up to the gauge, he lifts the gauge out and places it in position on the next box.

Welding Aluminum Alloy

In welding aluminum alloy, it is of extreme importance that all traces of the welding flux be removed from the joint as the presence of flux will excellerate corrosion. Merely washing in hot water will not suffice. One of the most effective methods in use consists of immersing the job for a short period of time in a hot 2 per cent solution of nitric acid. Another method involves the use of a steam jet, the steam impinging upon the welded joint. In case the work is subjected to a sand blast operation, the steam jet should be used both before and after this operation.

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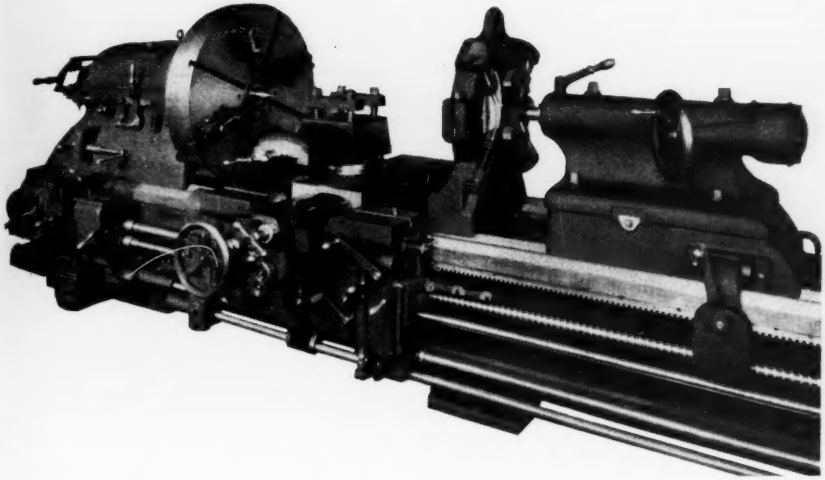

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Plant Records That Save Money

By J. J. BERLINER, B. C. S.
Senior Member, National Accounting Systems

TO the efficiently-run manufacturing business, machinery plant records are almost vital. Yet it is surprising how few concerns have recognized the advantages of keeping proper records of machinery and plant; or, recognizing them, have taken the trouble to compile adequate records and keep them up to date. The detailed inventory records of machinery and plant equipment, trucks and the like, are of incalculable value to an efficiently run business and will repay, over and over again, the time spent in making them accurate and reliable. The following are a few of the advantages obtained from keeping such records:

1. They provide, in convenient form, a complete inventory of machinery and plant, available at any time for such purposes as insurance, and so on.

2. They show the estimated value of every item of machinery and plant at any given date.

3. They enable depreciation to be intelligently figured for each item of equipment with due reference to its nature, uses, and probable life.

4. They will show in time whether the rate of depreciation written off is sufficient or not.

5. For the purpose of income taxes, they facilitate the making up of the depreciation schedules and obsolescence claims, and ensure that no properly-deductible claim is overlooked.

These records can be installed very easily without the usual difficulties that are entailed with the installation and operation of new records. In the first place, a complete inventory of the machinery and plant is made and values are placed upon the different individual items which, in the aggregate, will balance with the amount of the machinery and plant accounts on the general books of the concern. This is important, because the machinery and plant records are essentially an analysis in detail of the machinery and plant ledger accounts. After the inventory has been made, a number is given to each machine or other item of equipment and the number is painted or stencilled on it for identification purposes.

Figure 1 shows the form for the inventory record of machinery and plant. The principal thing to observe is that every item is listed on a separate sheet or card, which enables the records to be arranged in the most convenient way for the business. The form and its rulings are self-explanatory. Cards or loose leaves may be used, which is a matter, of course, of individual preference.

The machinery and plant account in the general ledger may be compared with a controlling account for sundry or miscellaneous creditors, where the "accounts receivable" ledgers are self-balancing. In fact, they are very much similar. The controlling account shows in the aggregate the sums due by customers, details of which will be found in the sales ledgers. In the same way details of the machinery and plant accounts will be found in the inventory records, and when the net values of the different items are totalled up, the figure obtained should equal the bal-

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ance at the debit of the machinery and plant accounts.

It is therefore important that the inventory records and the machinery and plant accounts should be reconciled every time the general books are balanced. The reconciliation statement takes the form of Figure 2. The totals of this statement should agree with the corresponding figures in the machinery account. It should be noted further that the total figure for ordinary depreciation will be taken from this statement instead of being calculated at a percentage rate on the value of the machinery at the beginning or end of the fiscal year.

It will be noted that the "Inventory Record" form, Figure 1, includes special columns for dealing with income tax allowances for wear and tear. These are necessary on the assumption that the income tax inspector may disagree with some of the rates of depreciation used in writing off depreciation. Thus one concern might write off 20 per cent on some machinery, which a revenue inspector might dispute. So it is essential that separate records be kept of the income tax rates of depreciation taken in order that the concern be in a position to substantiate their claims on the ground of obsolescence.

Where new machinery has been installed in place of machinery not wholly worn out, or because the old machinery has become inadequate or obsolete, an allowance is allowed of as much of the cost of replacement as is equivalent to the written-down value of the machinery and equipment replaced, less any sum realized by the sale of the old machinery and equipment. Unlike the allowance for wear and tear, the amount claimed or written off is on the ground of obsolescence.

An illustration will make this clear. Let us assume that a machine originally cost $12,000, that depreciation or wear and tear has to date amounted to $10,000 and that the old machine has been replaced by a more ef-

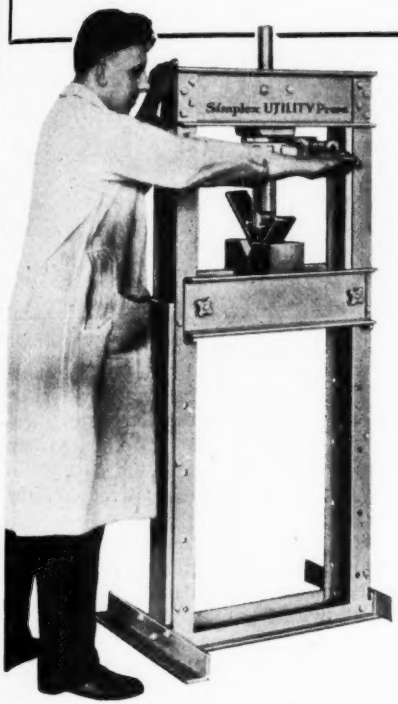
INVENTORY RECORD
MACHINERY AND PLANT

Item
Item No.
Date of Purchase
Purchased From
Original Cost
Freight and Installation
Total Cost
Estimated Life

Date	Location	Depreciation		Net Value	Income Tax Allowance for Depreciation		Net Value (Income Tax Purposes)	Misc.	Remarks
		Rate	Amount		Rate	Amount			

Figure 1—Inventory Record Form (5 x 8 in. card).

A New Press



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What will the 80,000 pounds pressure of the Simplex Utility Press do for me? Send a copy of your bulletin to

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Address_____

City_____ State_____

MACHINERY RECONCILIATION STATEMENT

	YEAR		CREDITS				
Item Number	Value Jan. 1, 1928	Add'ns During Year	Sales During Year	Ordinary Depreciation	Special Depreciation	Total Credits	Value Dec. 31, 1928

Figure 2—Machinery Reconciliation Form (Should be 8½ in. wide x 11 in. high card or sheet.)

ficient machine costing $11,000, the old one being sold as scrap for $800. The amount of obsolescence claim would be obtained as follows:

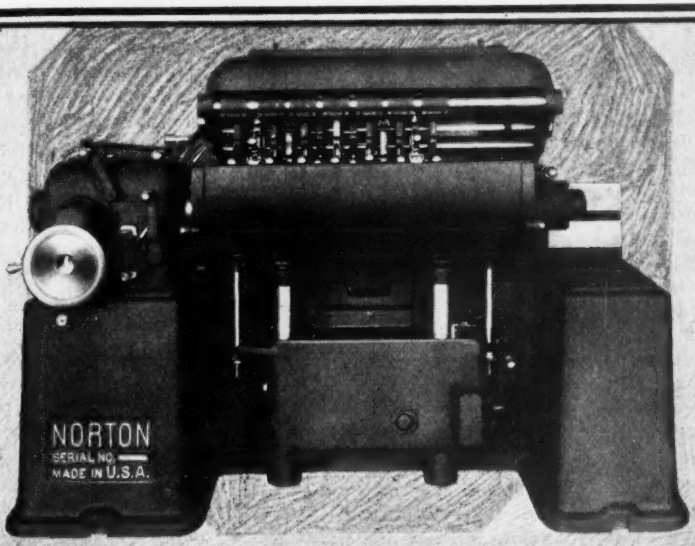
Original cost of machine.	$12,000
Less depreciation to date.	10,000
Book value to date.....	2,000
Less sum realized as scrap	800
Claim for obsolescence..	$ 1,200

If properly kept, the inventory records will give, at a glance, all the information required to enable claims of this kind to be satisfactorily made. There is no doubt that inventory records along the lines indicated are well worth while, and more than repay the effort and cost of keeping them. In addition, inventory records make possible a comparison of book values with the present day values and enable calculations to be made of allowances, by way of special depreciation claims, for substantial drops in values which may have taken place.

Cutting Lubricants

A cutting lubricant is intended to perform two functions; it keeps the cutters cool by carrying off the heat that is generated by the friction of the tool against the work, and it makes the task of the tool easier by lubricating the contacting surfaces. To obtain the best results in the use of lubricant, it is necessary that the stream be directed so that it flows not only over the cutters, but so that it floods the point of contact between the cutters and work, as well. The make-shift water-pots which served the purpose in the days of carbon-steel tools—and which are still to be found in too many shops—are no longer adequate; new machines should be purchased equipped with pumps of modern design, and pumps should be obtained and applied to machines which are not so equipped. Successful competition in these days is possible only by the use of modern methods and equipment.

For Lapping Crankshaft Pins and Bearings



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LAPPING MACHINES

Machining Parts for Wright "Whirlwind" Engines, III.

By PHILIP WINTER

EACH cylinder of the Wright "Whirlwind" Aircraft Engine is built up by screwing and shrinking a cast aluminum head onto a forged steel barrel, the threads of which have been treated with a sealing compound to prevent oil leakage. The barrel is forged with a heavy hold-down flange and 26 closely-spaced cooling fins, and is finished all over. Each barrel forging is heat-treated before it is placed in production, both to give it the necessary seasoning and to impart to the steel the maximum of toughness and resistance to wear.

The first machining operation on the cylinder barrel is performed on an automatic machine of the vertical type, shown in Fig. 16. The machine is built with six "stations;" thus five cylinder forgings are in process simultaneously while the pieces at the sixth station are being changed. The pieces are held in chucks which are located at equi-distant points on a circular table which revolves about a vertical column. This column carries the five ways upon which the tool slides operate, the sixth side being the loading station. The speed of the machine is controlled by the longest one of the six operations, in the same manner as an automatic machine of the horizontal type. The tools are kept flooded by lubricant which is poured over them through double sets of pipes, located at the front of each station.

The operator is shown in the illustration in the act of tightening the chuck-jaw, using a large T-wrench. The chuck remains motionless at this station, but as the table indexes, the gears which control the speed of the chuck engage and as the table comes to a stop at the next position, the tool slide moves down to the piece and the operation begins.

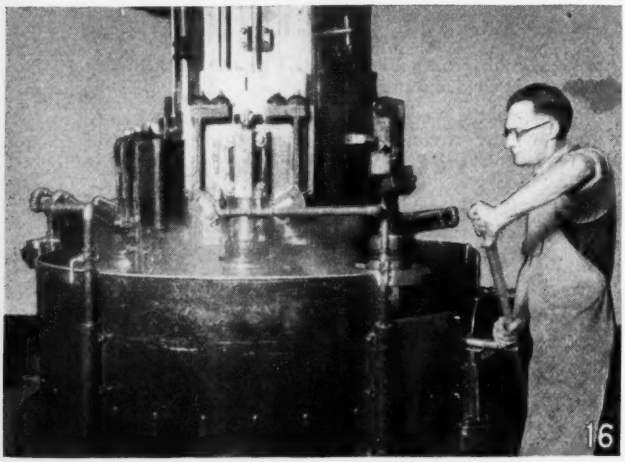

Fig. 16—The cylinder barrel is bored and faced and the flange is turned and faced in this machine. A barrel is finished every seven minutes.

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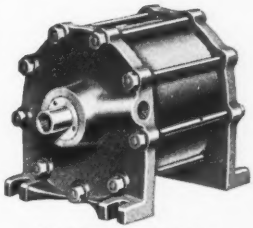
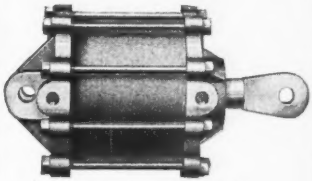

Model "B" Cylinder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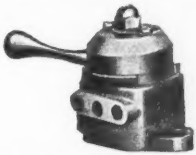
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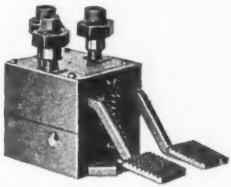
Model "H" Foot Valve

LOGANSPORT MACHINE COMPANY
Dep't 330, Logansport, Indiana

Please send me a copy of Circular 24 and 24-A. Of course, there is no obligation.

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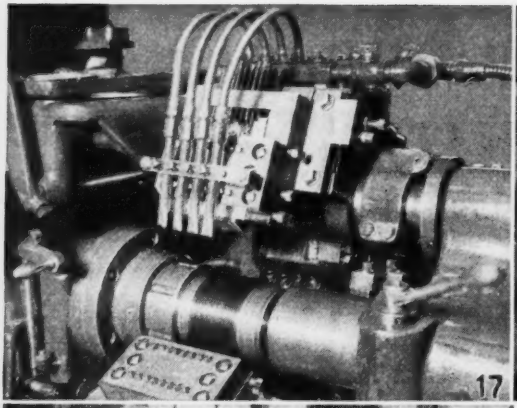
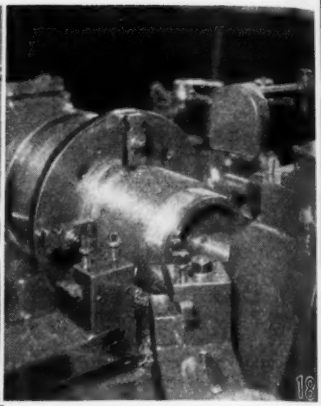
Firm .....
Address .....
City..... State .....





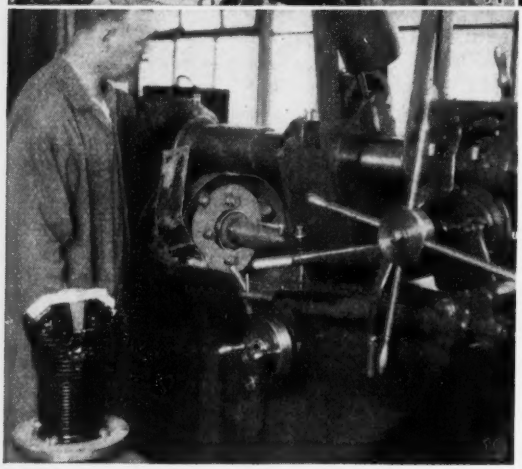


Fig. 17 — This automatic lathe machines the fins to the required thickness and faces the under side of the flange. Fig. 18 — The threads for the cylinder head are milled in this machine. Fig. 19 —Grinding the bores to size. The .020 in. of stock is removed in 21 min. with this machine.

This slide carries a boring tool with a micrometer head, with which the bore is machined down half way. At the same time a turning tool on one side turns the outside of the barrel down to the flange, and a similar tool on the opposite side turns the flange.

At the next station the end of the barrel and upper side of the flange are faced, the barrel is undercut to provide clearance in the angle of the flange with the barrel, and the corners are chamfered. At the next station, which is the fourth, the remaining half of the bore is machined and at the fifth station the end of the bore and flange are finish faced. At the sixth and last station, a finishing cut is taken the entire length of the bore, and the barrel and flange are finish turned. The outside diameter of the barrel is held to a limit of .002 inch, and approximately .020 inch is left in the bore for grinding. A cylinder barrel is finished on this operation every seven minutes.

The next operation on the cylinder barrel is performed in the automatic lathe shown in Fig. 17. Here the fins are machined to the desired thickness and the under side of the flange is faced. Three sets of cutters are used, 24 tools forming a set. The first set feeds straight into the slots between the fins, facing the metal on

Grinding time reduced 25 to 30%
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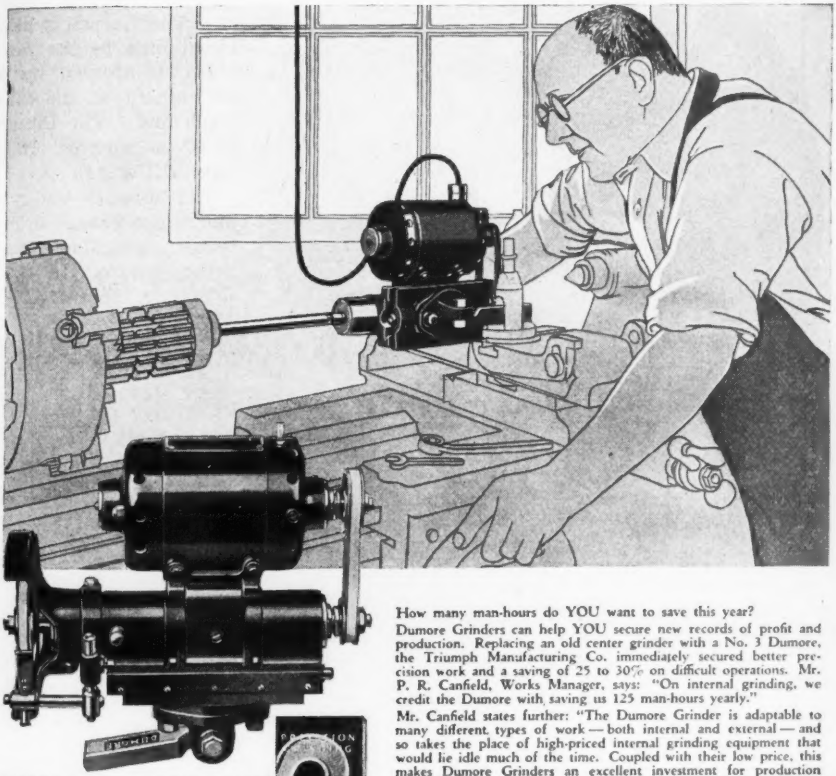

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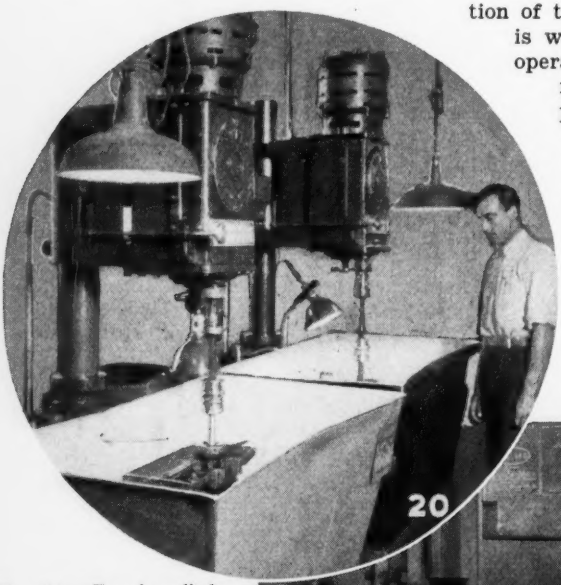
both sides of the slot and leaving 1/64 in. for finishing. The two sets of finishing cutters are arranged so that the cutters in one set face one side of each slot, the cutters in the other set finishing the other side. The entire operation is automatic, the operator being required only to chuck the work and remove it.



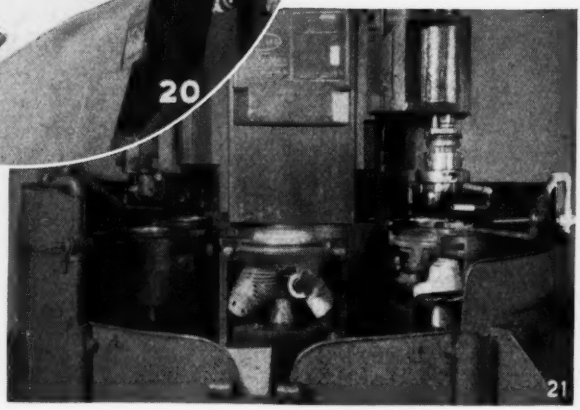


Fig. 20 — Each cylinder bore is given a glass-smooth finish in the Hutto honing machine. Fig. 21— Here the cylinder is bored, counterbored, tapped, and a radius is machined in the dome. The production is 60 pieces per hour.

The operation shown in process in Fig. 18 is that of milling the threads for the cylinder head on the end of the barrel. The machine is a Hanson-Whitney thread miller, which is equipped with a circular cutter that is ground to the exact form of the thread, and which revolves at a high rate of speed while the cylinder barrel slowly revolves. The cutter is set at the correct angle to produce a perfect 12 P. thread, and feeds automatically at the necessary rate per revolution of the work. While this tool is working automatically, the operator uses the front tools to neck and chamfer the piece. The barrel is held by clamps to the face plate, reinforced by a bull center in the tailstock end. The thread is of a modified Butterworth design.

The bores of the cylinders are ground in internal grinding machines similar to that shown in operation in Fig. 19. The cylinder is clamped to a ring such as the one shown on the bench, this ring being made to fit into a fixture on the machine. Thus the matter of chucking is simplified and reduced to the minimum time. The .020 in. of stock is ground out in 21 minutes, the bore being finished to

(*Continued on page* 32)

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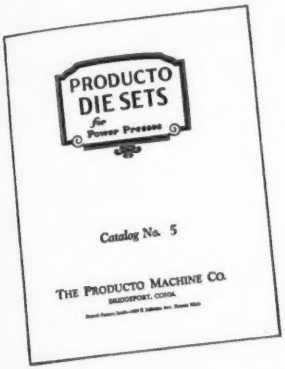

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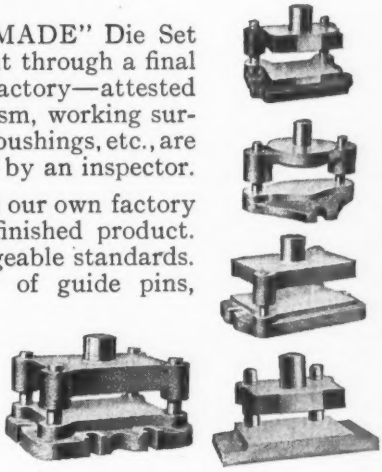

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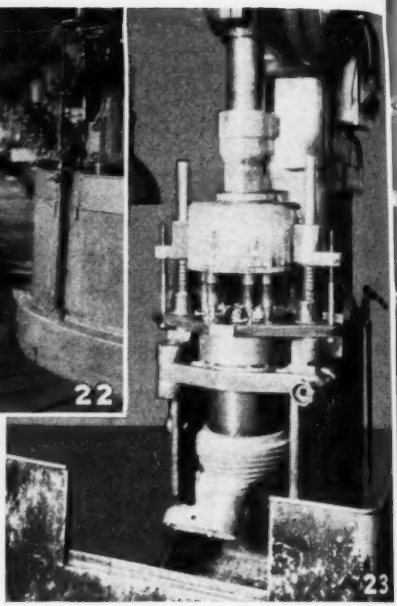


Fig. 22—Looking down the conveyor line in the cylinder head department. Fig. 23—Drilling stud holes in the flange of the cylinder head.

Machining Wright Engine Parts

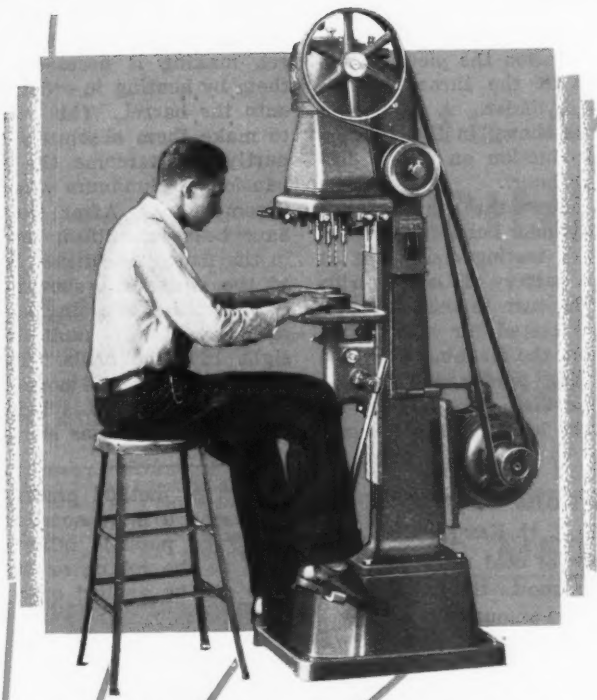
(*Continued from page* 28)

4.500 in., within a limit of .001 inch.

After grinding, the bore of each cylinder is given a glass-smooth finish in the Hutto honing machine shown in Fig. 20. Each cylinder is held in a fixture which holds it in a perpendicular position and a Hutto hone with nine stones is reciprocated vertically in the bore at a high rate of speed, the hone also revolving during the operation. Approximately .001 in. is removed, which takes about 15 minutes, and the bore is finished to within .0003 in. of the drawing size. Two machines are kept busy constantly on this operation.

The machine used to bore and tap the cylinder heads, shown in Fig. 21, is similar to the machine used for machining the barrels. The photograph used in this illustration was taken from the loading position, so that the manner of clamping the piece in the fixture can be clearly seen. The first machining operation, at the second station, consists of boring and counterboring the interior of the head. The boring operation is performed with a tool that is held in a swivel fixture, which can be seen on the left side of the machine. The cutting tool itself is a toolbit, clamped to a plate which revolves in a slot in the holder. Teeth cut into the plate mesh with a rack which, when the tool has reached the proper depth, feeds upward and thus revolves the plate. As the plate revolves, the tool cuts a radius in the dome of the head. Approximately 1/32 in. is left in the head for the finishing operation.

At the next station a recess is cut at the junction of the straight bore with the radius in the dome, to provide clearance for the tap. At the fifth station the piece is finish bored and the radius is finished with a tool which is a duplicate of that used for



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roughing the dome. The bore is held to 5.248 in., with a limit of .002 inch. At the sixth station the piece is tapped 12 P. to fit the thread on the barrel of the cylinder. A collapsible tap is used, as shown in the illustration. The production on this operation is 60 per hour.

Figure 22 shows the conveyor line through the cylinder head department, with the water testing equipment at the left and a battery of Barnes drills just beyond the turn in the conveyor. All heads are tested for leaks after they come from the machine described in the preceding paragraph, and before they are drilled.

The cylinder heads are bored approximately .020 in. smaller than the outside diameter of the cylinder barrel, making it necessary to expand them by heating in order to get them onto the barrel. This is done partly to make them absolutely secure, and partly to overcome the greater expansion of aluminum when the motor becomes hot. After the two parts have been assembled, the stud holes in the flange are drilled with the aid of the equipment shown in Fig. 23. This machine is a single spindle drill, equipped with a multiple head and eight 13/32-in. drills. The piece locates by the turned portion just back of the flange, and is held in the jig by a strap-clamp, as shown.

Distortions In Steels

By R. H. KASPER

EVERY user of cold rolled machinery steels knows that machining, regardless of the amount of care used, will invariably cause distortion. This characteristic is usually considered as peculiar to the material, although efforts are generally made to counteract the tendency to distort, as far as possible. In cases where a number of keyseats are to be cut in a shaft, an effort is made to counteract distortion by staggering the keyseats so that no two of them will be in the same parallel. This method has the effect of producing a number of smaller distortions in different directions, with a general effect which is less disagreeable to the eye, and which reduces the difficulty of straightening, when such treatment is necessary.

In most cases where distortion is encountered, a change in material from "cold rolled" to "hot rolled" machinery steel will almost, if not entirely, eliminate the difficulties. Cold rolled or cold drawn steel, as its name implies, is rolled or drawn after cooling. This method produces a better finish and a more accurate size than would be possible otherwise. However, as the rolling or drawing pressure can be applied only to the outside of the bar, the metal at the center of the bar is affected less than the metal closer to the surface.

Examination under a microscope will show a grain structure varying gradually from fine near the surface to somewhat coarser at the center, due to the fact that the crystals nearer the surface will have been broken up by the cold working process. Each part of the cross section of the bar will be in a different state of tension as a result of this variation in grain structure. Annealing will relieve this tension somewhat, but it cannot eliminate it entirely* as the grain structure is only slightly affected by the treatment. As soon as the outer surface of a bar of cold rolled steel is

(*Continued on page* 100)

*(Editor's Note): A low temperature anneal will partially relieve strains without changing the grain size. If the annealing is carried on long enough, it will completely change and refine the grain structure.

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Rear View showing application of Motor Air Cleaner.

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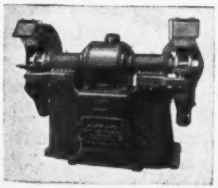

Non-Ferrous Metals and Alloys, II.

By George M. Enos
Assistant Professor of Metallurgy, University of Cincinnati.

In this article, the second of a series dealing with non-ferrous metals and alloys, the subject of brasses and bronzes is discussed from the view point of their composition, constitution, heat treatment and uses.

BRASS is a general term used to describe any one of a large number of copper base alloys. Strictly speaking, brass is an alloy of copper and zinc, usually containing not over 40 per cent zinc. Brasses containing other elements than copper and zinc, except in negligible amounts, are properly called "modified brasses." In general practice, brass means any alloy in which the principal ingredients are copper and zinc.

Bronze is an alloy in which tin is the metal alloyed with the copper to produce the desired physical and chemical properties in the alloy. Like the brasses, there are many modifications of the true bronzes. Ordinarily a straight bronze does not contain over 20 per cent tin, and it is often difficult to determine from surface appearance whether an alloy is a brass or a bronze. In brasses, tin and lead are the principal metals added, singly or together, to modify the properties of the copper-zinc base alloy. In bronzes, lead and zinc are the elements most frequently used in forming the more complex alloys.

The use of brasses and bronzes dates back to prehistoric times. Today they are manufactured into many forms; sheets, tubes, rods, bars, extruded forms, and castings. Alloys of copper, whether the brasses, bronzes or other special types, are so widely employed because copper itself does not have the physical properties needed for many uses. Thus, while copper in the hard drawn condition may have a tensile strength of around 70,000 lbs. per sq. in., yet a certain class of brasses and bronzes may reach this value in the "as cast" condition. As cast, copper has only a tensile strength in the neighborhood of 20,000 lbs. per sq. in.

For copper, and the copper rich alloys, the ductility is high. The property of high electrical conductivity possessed by copper is shared by many of its alloys. The machineability of all copper alloys is especially good. Probably the best of all the alloys of the brass or bronze type, regarded merely from the viewpoint of ease in machining, is the straight brass containing 40 per cent zinc.

Metallography of Brass

Copper and zinc form a series of "solid solutions." The part of the diagram of commercial importance is shown in Figure 1. It will be noticed that with alloys containing less than 37 per cent of zinc that only one constituent—the alpha solid solution—is present. For alloys containing from 36 to 45 per cent of zinc two constituents appear; the alpha and beta solid solutions. Under certain conditions only the beta solid solution will appear. Figure 2 shows some typical microstructures of various brasses.

It is obvious that many brasses containing only copper and zinc may be prepared, and that a great many "modified" brasses are possible. Table

Two Factors

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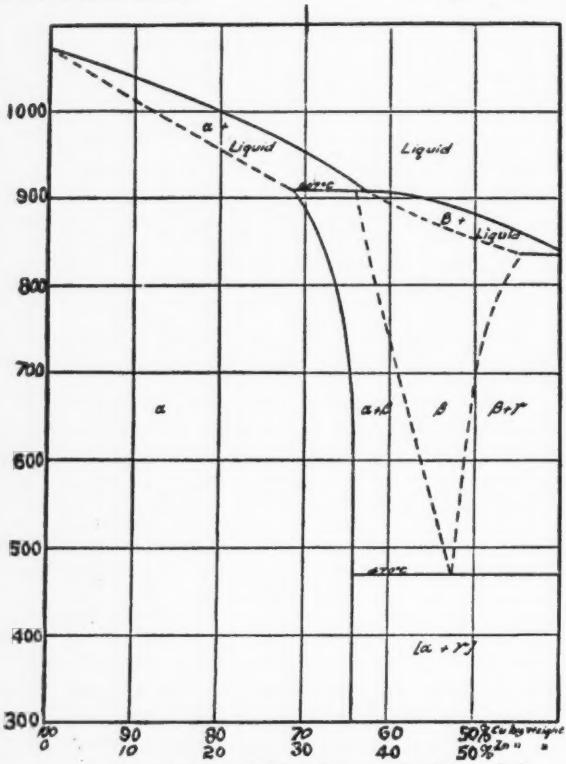
I, abstracted from "Outline of Metallurgical Practice," by Hayward (D. Van Nostrand Co.), lists the principal Industrial Brasses.



Structural equilibrium diagram of copper and zinc

Fig. 1—From Tech. Paper 59, U. S. Bureau of Standards.

Industrial Brasses

Of all the brasses listed in Table I, three can be selected for special comment. Cartridge brass, a 70-30 alloy of copper and zinc, is used for a diversity of purposes. The name "cartridge" suggests one of its principal uses. It has a remarkably high ductility. It is a stable alloy—a simple alpha brass. The exact percentage of copper appears to be of little importance, but the percentage of impurities should be kept low. It is usually used in the cold worked condition, rather than as castings. A modification of cartridge brass is Admiralty brass, which contains up to 1 per cent tin. This brass is much used in condenser tubes. One of the most common brasses for general use is the standard yellow, or "low" brass, containing approximately 2 parts of copper to 1 part of zinc.

Muntz metal is a straight brass containing the beta constituent. It is usually made up quite close to the specified 60-40, copper-zinc ratio and with very low percentage of impurities. As noted before, this is a popular brass for machining. Usually the composition is modified by adding from 1.5 to 2 per cent of lead, which improves the machineability. The presence of lead causes a "shortness" to the metal which permits the turnings to leave the tool readily.

Heat Treatment of Brasses

In the cold working of brass, the alloys containing up to 37 per cent zinc are used. Brasses containing up to 45 per cent zinc can be rolled hot, that is, they are malleable, but are not ductile. When any cold working process, such as drawing, has been performed, an annealing operation may be—and usually is—necessary to restore the metal to a condition which will permit further fabrication. Hence brasses are frequently annealed after

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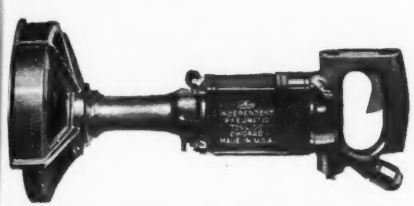

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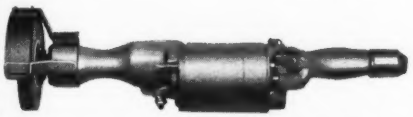

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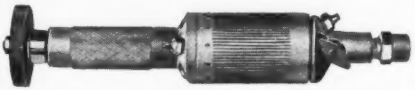

Nos. 0 and 00 midget grinders for touching up dies, etc. No. 00 has speed of 28,000 R. P. M. and carries a 1¼" Elastic Bonded wheel. No. 0 has a speed of 14,000 R. P. M. and carries a 2½" Elastic Bonded wheel. Wt., 2¾ lbs.

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a number of passes through the cold working machinery.

It will be noticed in Fig. 1 that the alpha brasses remain in that phase at any temperature below the melting point. Grain refinement takes place at the recrystallization temperature. A recrystallization may be said to consist in the change from a strain-hardened to an unstrain-hardened condition. The temperature at which this change takes place varies with the degree of previous cold work and

(Continued on page 46)

TABLE I. INDUSTRIAL BRASSES

Industrial Brass	Composition Copper %	Zinc %	Color	Malleability and Ductility
Red brass	90	10	Yellow-red	Malleable and ductile when cold; the properties decrease with increase of zinc.
Tomback	85	15	Red-yellow	
Fine casting brass and brazing metal	80	20	Yellow	
Pinchbeck, sheet brass	75	25	Pale yellow	Malleable and ductile cold or hot, usually only rolled.
Fine yellow brass	70	30	Pale yellow	
Standard yellow (common, low) brass	66.6	33.4	Deep yellow	Malleable only hot (not ductile).
Common yellow brass	63	37	Deep yellow	
Muntz metal	60	40	Golden-yellow	Same
Extrusion metal	55	45	Golden-yellow	Same

This table abstracted from "Outline of Metallurgical Practice," by Hayward (D. Van Nostrand Co.)

U. S. Government specifications, July 1, 1910.
Brazing metal: Cu 84-86, Zn 14-16, Fe 0.06, Pb 0.30
Sheet brass: Cu 60-70, Zn 30-40, Pb 0.50
Admiralty metal: Cu 70, Zn 29, Sn 1.0, Pb 0.075, Fe 0.06.
Low brass: Cu 64-68, Zn 32-34, Fe 2.0, Pb 3.0
Brass rods: Cu 60-63, Zn 37-40, Pb 3.0
Cast naval brass: Cu 59-63, Zn 35.5—40.5, Sn 0.5—1.5
Extrusion metal: Cu 59-62, Zn 39-41, Pb 0.6

TABLE II. INDUSTRIAL BRONZES

Name	Composition Copper %	Tin %	Zinc %	Lead %	Added Element %	Malleability and Ductility
Malleable Bronze	98-94	2-6	.....	.....	.....	The tensile strength of alloys in this class when properly heat treated varies, 25,000 to 50,000 lbs. per sq. in. The ductility is increased by slow cooling. As the tin content increases the tensile strength increases but the ductility decreases.
Gun Metal	92-88	8-12	.....	.....	.....	
Gun Metal	87-89	9-11	1-4	.2	Iron 0.06	
Bell Metal	80-75	20-25	.....	.....	.....	
Statuary Bronze	90-78	2-4	10-18	1-4	.....	
Coin or Metal Bronze	90-96	10-4	¼ 0-1 ¼	.....	.....	
Speculum Metal	70-67	30-35	.....	.....	.....	
Common Bearing Bronze	81-87	19-23	.....	.....	.....	
Common Bearing Bronze	81-84	17-10	2-8	.....	.....	
Phosphor Bronze	90-91	9-8	.....	.....	Phos. 1	
Phosphor Bronze	80-90	6-8	2-14	0.20	Phos. Iron .3 .06	
Silicon Bronze	97-98.5	1-2	1-1.5	.....	Silicon .05-.07	
Manganese Bronze	75-76	6-5	.....	.....	Manganese 16-17	

This table abstracted from "Outline of Metallurgical Practice," by Hayward (D. Van Nostrand Co.)

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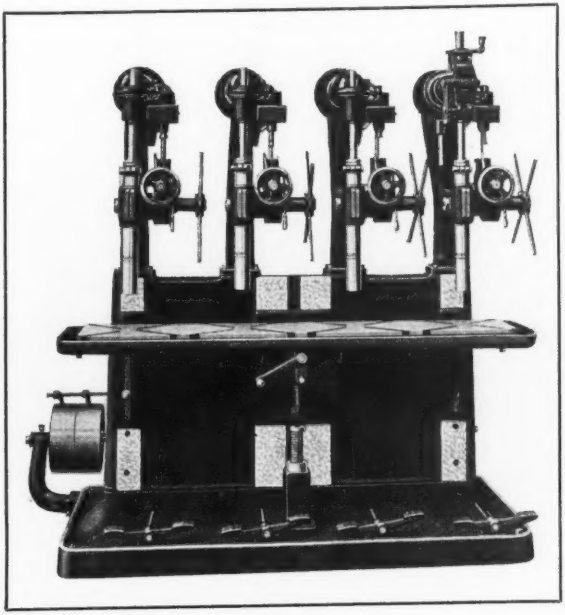
The SUPERIOR GANG DRILL



Production requirements often call for various drilling operations on the same part.

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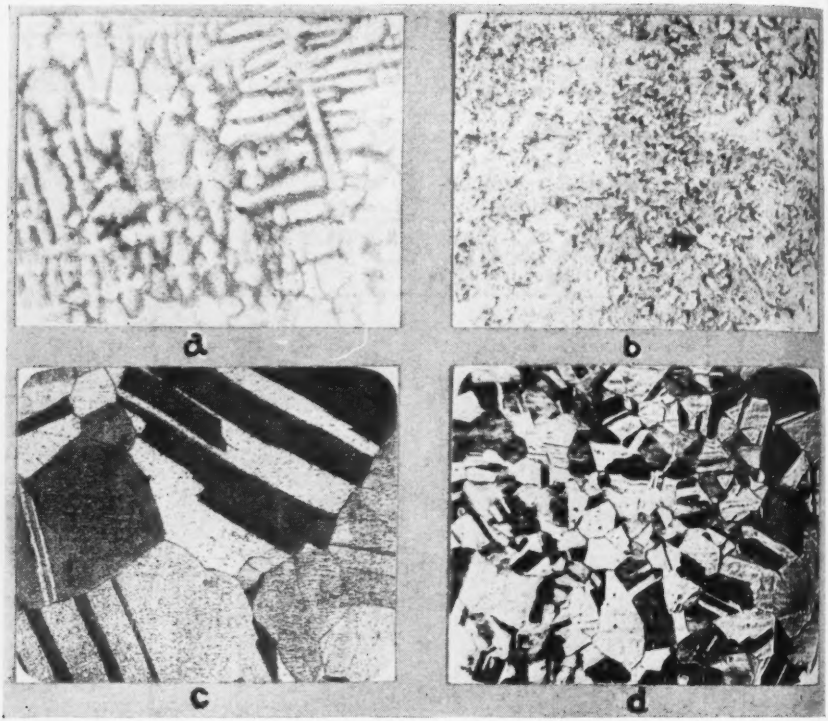

Fig. 2—(a) 70-30 copper-zinc brass, as cast, etched with $NH_4OH+H_2O_2$, X 100. (b) 60-40 copper-zinc brass, as cast, etched with $NH_4OH+H_2O_2$, X 100. (c) 70-30 brass, worked and annealed, etched with acidified $FeCl_3$, X 100, note large grain size and twinning. (d) 67-33 brass, worked and annealed, etched with $NH_4OH+H_2O_2$, X 100. A more desirable grain size than in (c).

Non-Ferrous Metals

(*Continued from page* 42)

the time of exposure to the heat.

The "beta" brasses, when heated to a temperature where only a solid solution (beta) can exist, may be quenched, retaining a fine grain size and the single beta phase. But if slow cooled from temperatures where beta only can exist, the normal structure will be alpha plus beta crystals.

Metallography of the Bronzes

In Fig. 3 is shown that portion of the copper-tin equilibrium diagram dealing with commercial bronzes. Very few commercial alloys contain more than 12 per cent tin. Accordingly most bronzes have but the one constituent, and are known as alpha bronzes. As with brasses, many modified bronzes are possible, but the composition range is not so great. With slowly cooled bronzes that are rich in tin, that is, having 10 to 12 per cent in, a second constituent, delta, may appear. In Fig. 4 are shown some typical photo-micrographs of bronzes.

Industrial Bronzes

In Table II pertinent data regarding a few industrial bronzes is given. The best combination of strength and

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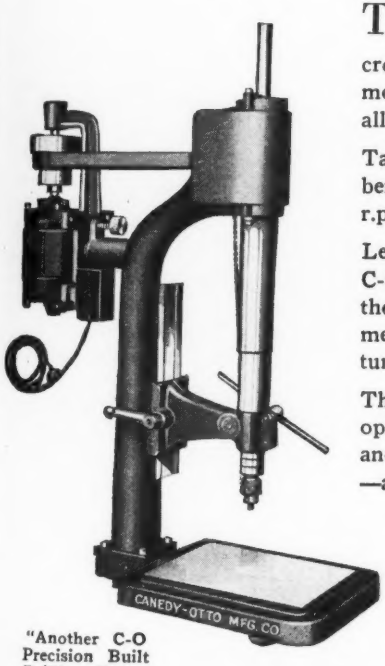

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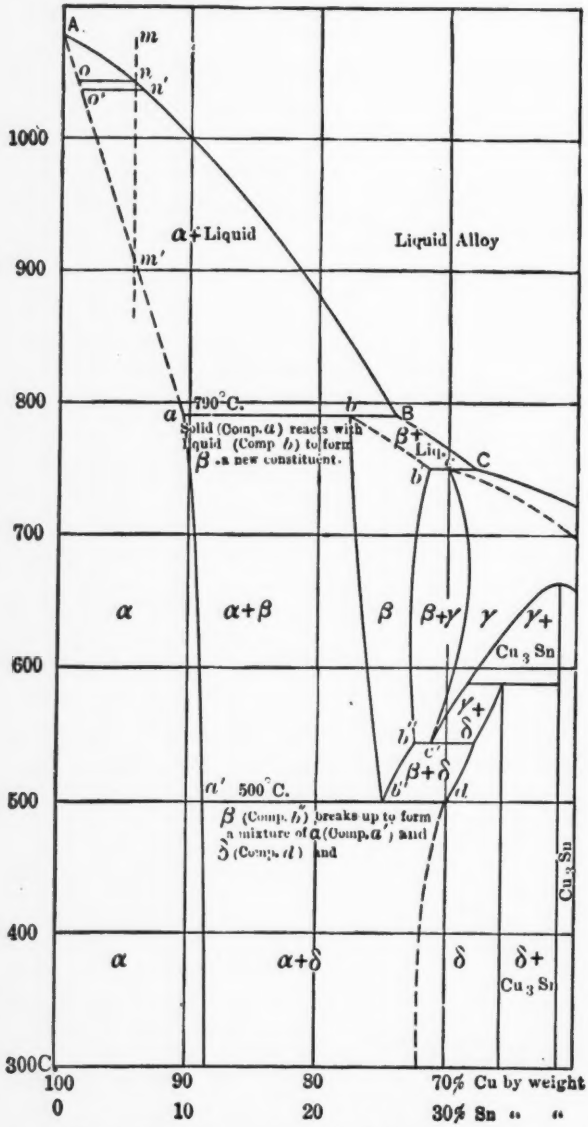


Fig. 3—From P. 421, Trans. A. I. M. E., Vol. 64.

ductility is reported as a 95-5 copper-tin alloy. For high pressures an 85-15 bronze is said to be satisfactory.

The presence of tin in copper increases resistance to corrosion. Phosphorus in bronze is added to act as a deoxidizing agent, and also to actually alloy with the other metals. Some so-called phosphorus bronze contains no phosphorus, since only a sufficient quantity was added to effect deoxidation.

Bronzes may be used "as cast" or in the "worked" condition. Obviously the physical properties will vary considerably with the physical condition; i. e., whether the metal is "as cast," "worked," or "worked and annealed."

As to uses, phosphor bronzes are said to be especially resistant to corrosion by salt water and to be very suitable for use in bearings. Gun metal, probably the best known of the bronzes, sometimes called "88-10-2," is, of course, no longer used in the manufacture of arms, but is useful in bearings, sea-fittings and general use. It is not generally recommended for use with steam. Bronzes containing lead are used as machined castings for locomotive slide valves and other work where a fair resistance to abrasion and a maintenance of strength at relatively high tempera-

LITTLE LESSONS IN GRINDING COSTS

BILL VANCE took up the thread of his story, which the Superintendent, Tom Carson, had interrupted.

"As I said, the saving of 15% in the cost of the wheel itself, based on unit cost per cu. in. of abrasive material,* only partly explains the economy of large-diameter grinding wheels. That factor is not enough to explain the saving of 30% which you have remarked in this test at your plant.

MANY THEORIES ADVANCED

"Various authorities have tried to explain this surprising difference.

"One theory is that the larger diameter wheel has greater centrifugal force and, therefore, throws off the particles of metal more energetically, so that the wheel does not fill up so quickly and needs less dressing.

"Another theory is that the larger wheel, because of its greater circumference, brings each bit of grit into contact with the metal less often and gives it more time to cool off during each revolution.

"Another plausible explanation is that the greater mass of the large wheel gives it greater inertia and causes less fluctuation of speed under peak loads—just as the heavy fly wheel acts on one of your punch presses.

Summarizing Bill Vance's explanation of the economy of 30x3x12" wheels as compared with 24x3x12" wheels:

(1) The 30 in. wheel gives 92% more abrasive at only 64% more cost.*

(2) Each particle of grit on the surface of the 30 in. wheel has 25% less work to do.

(3) The 30 in. wheel weighs 75% more and has 60% more inertia.

RESULT: Average of actual test results 30% lower grinding cost.

Investigate for your own satisfaction. Let us send you complete data. The coupon is for your convenience. Use it *today*.

** See previous installment in this series. We will send you a reprint of it, if you wish.*

"Recently a customer of ours suggested still another explanation. His theory is that the flatter arc of the large diameter wheel forms a full contact with the surface of the work more quickly.

LET THE WHEELS BUY THE MACHINES

"But, whatever the explanation, the facts are as you see them on your test report. By using 30 in. wheels, you can save enough in your grinding costs to pay for a couple of those 'Rite-Speed' grinders of ours that I have been telling you about. You can, in fact, pay off their cost in less than a year. After that the saving will be all clear profit, *plus* the greater efficiency of these 'Rite-Speed' machines."

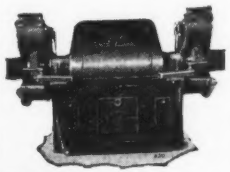
"Well, Vance," said the Superintendent, "there seems to be no argument about that, on the face of these test results. Give me the specifications and I'll put a purchase order through."

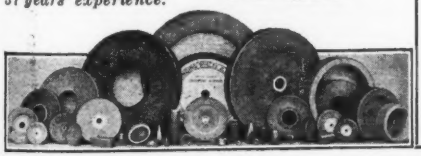
(Curtain)

Have you, yourself, ever investigated this matter of the economy of large diameter wheels, and the advantages of the SAFETY "Rite-Speed" Grinder for *automatically* maintaining the correct peripheral speed? Ask us for the proof. The coupon below is for your convenience.

The SAFETY "Rite-Speed" Grinder automatically enforces an increase in speed as the wheels wear down, thus insuring more efficient grinding and lower costs.

"A wheel for every need" . . . backed by 37 years' experience.





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tures is desired. A common composition for this service would be 85-10-5-.5 copper-tin-lead, phosphorus.

Silicon and manganese are deoxidizers, and are added for that purpose. Silicon is also considered as a toughening agent. Some "manganese bronzes," so-called, are really manganese brass, that is, they are copper-zinc-base alloys with very small amounts of iron, tin, aluminum and manganese present.

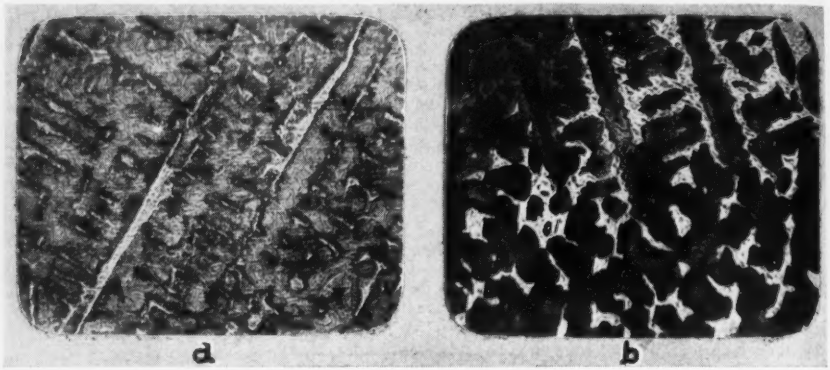


Fig. 4—(a) Typical alpha bronze as cast, etched with acidified $FeCl_3$, X 75. (b) 85-15 copper-tin bronze, as cast, etched with acidified $FeCl_3$, X 100. Note delta constituent (white).

Heat Treatment of Bronzes

Bronzes are often used in the heat-treated condition. By quenching from a high temperature the ductility may be improved and in some cases even the tensile strength is increased at the same time. Guillet has shown that the greatest strength is obtained, in straight copper-tin alloys, from samples quenched from about 600° C. Also, the higher the tin content the more the quenching improves the ductility, in proportion. Annealing may be practised as needed, for the release of strain, as discussed under the heat treatment of brasses.

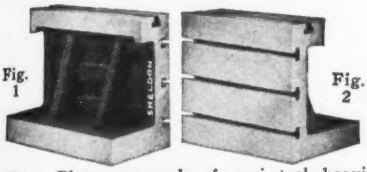
Miscellaneous Alloys of Copper

Nickel and copper dissolve in each other in all proportions. Small additions of nickel to copper serve to strengthen the copper. In the higher percentages, cupro-nickel alloys are formed which are suitable for coinage, wires, and various semi-ornamental uses. Arsenic in very small amounts is sometimes used to harden copper for electrical purposes. Silicon serves as a hardener and about 0.1 per cent is added to copper to be used in wires for telephone wire use and the like.

Aluminum may be added to copper, and in amounts between 8 and 11 per cent greatly increases the tensile strength without much loss in ductility. This alloy is sometimes known as aluminum bronze. It may be heat-treated, much as steel is, even to the temperature range. The alloy has a pleasing gold-like color. It may be used in either wrought or cast form. There are numerous ternary and quaternary alloys of copper, some of which have already been discussed with the bronzes. The nickel silvers, chromium bronzes, Monel metal, and numerous special alloys are of interest but cannot be discussed in a brief article of this kind.

(*Continued on page* 102)

Sheldon 90° Angle Plates

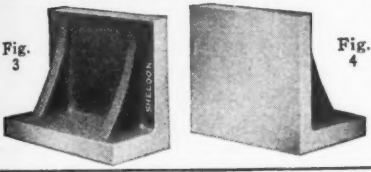


These Plates are made of semi-steel, heavily ribbed, insuring close-grained, rigid castings.

With Second Face and T Slots

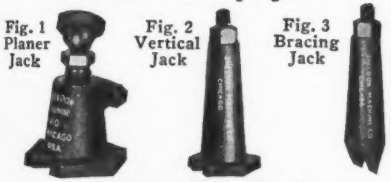
No.	Size Face	Size Top	Size Base	T Slots	Wt., Lbs.	Price, Each
1T	3¾ x 5	1½ x 5	2½ x 5	4–¼"	5	$10.00
2T	6 x 7	2½ x 7	4½ x 7	4–½"	20	15.00
3T	8 x 9	3 x 9	6 x 9	4–½"	38	20.00
4T	10 x12	3½ x12	7¾ x12	4–⅝"	75	30.00
5T	14 x16	4 x16	9 x16	4–⅝"	170	45.00

SHELDON 90o PLAIN ANGLE PLATES



No.	Size Face	Thickness Face	Size Base	Wt., Lbs.	Price, Each
1P	3¾ x 5	½	2½ x 5	4	$ 8.00
2P	6 x 7	¾	4½ x 7	15	10.00
3P	8 x 9	1	6 x 9	30	14.00
4P	10 x12	1¼	7¾ x12	60	20.00
5P	14 x16	1½	9 x16	145	30.00

Sheldon "Set-Up" Jacks



PLANER JACKS (Fig. 1)

No.	Height, Contracted	Height, Extended	Diam., Screw	Weight, Lbs.	Price, Each
1	2¾	3¾	⅞	1½	$1.25
2	3¾	5¼	1⅛	3	2.10
3	5¼	7½	1¼	6	3.00
4	7½	12	1½	12	6.00

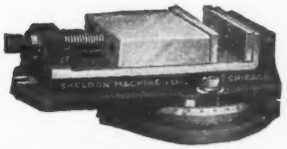
VERTICAL JACKS (Fig. 2)

1	2¾	4	⅝	1½	$ .75
2	4	7½	⅝	2	1.10
3	6¾	12	¾	5½	1.70
4	8¾	15	1	7	2.50

BRACING JACKS (Fig. 3)

1	3¾	6	⅝	1	$ .65
2	4¾	8	⅝	2	1.00
3	6¾	12	¾	3	1.50
4	8¾	16	¾	4	2.10

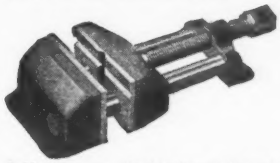
Sheldon Milling Machine Vises



Furnished Both Plain and With Swivel Base.
SPECIFICATIONS AND PRICES:

No.	Width of Jaws	Depth of Jaws	Jaws Open	PLAIN VISE Wt., lbs.	PLAIN VISE Price	SWIVEL VISE Wt., lbs.	SWIVEL VISE Price
3	3½"	1⅜"	2½"	15	$16.00	25	$20.00
4	4½"	1⅝"	3½"	30	$20.00	45	$24.00
6	6½"	2"	4½"	70	$30.00	90	$40.00
8	8½"	2½"	7"	160	$45.00	225	$60.00

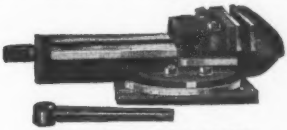
Sheldon Drill Press Vises



Guide Bars are Hardened and Ground.
SPECIFICATIONS AND PRICES:

No.	Width of Jaws	Depth of Jaws over Guide Bars	Full Depth of Jaws	Jaws Open	Wt., lbs.	Price
D 4	4½"	1⅝"	3"	4"	15	$12.00
D 6	6½"	1¾"	3½"	6"	35	$18.00
D 9	9"	2½"	4½"	9"	70	$24.00

Sheldon Shaper Vises



SPECIFICATIONS AND PRICES:

No.	Size of Jaws	Vise Opens	Bolt Hole Spacing*	Wt., lbs.	Price
1	12" x 2½"	12½"	7½"	175	$120.00
2	14" x 2⅞"	13½"	8½"	240	$135.00

*Distance between holes can be changed without additional charge.

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Gas Welding In the Aircraft Industry

By Charles E. Kirkbride, Jr.,
Asst. Chief Draftsman, Naval Aircraft Factory,
U. S. Navy Yard, Philadelphia, Pa.

ONE of the most important and difficult of the tasks that are constantly before the aircraft designer is the production of an airplane structure that will be stronger and lighter in weight than its predecessor.

In the accomplishment of this task, oxy-acetylene welding has been used to great advantage. In fact, it is now reasonable to state that oxy-acetylene welding has become the standard method of steel fabrication of commercial aircraft because of its general use in the construction of fuselages, landing gear and miscellaneous parts that go to make up the completed plane. In this connection it is pointed out that while the modern airplane owes much to the welding industry, the aircraft industry, on the other hand, due to the extreme exactitude and precision required in its processes, has in turn contributed greatly to the advancement of the art of welding.

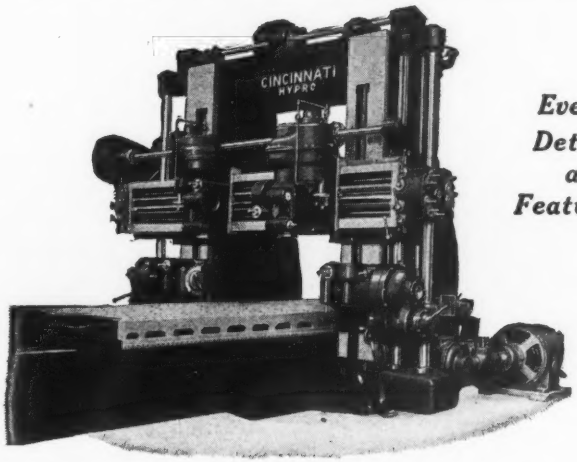
The aircraft builder approached the welding proposition with considerable apprehension, due to a natural prejudice of the aircraft designer against welding. The struggle involved in overcoming this prejudice and in developing the technique which has brought oxy-acetylene welding to its present high state of perfection and reliability in the aircraft industry is beyond the scope of this article. Suffice to say that this natural prejudice was at least well founded in that the airplane demands a degree of strength and reliability far beyond the demands of any other industry, and that the airplane in itself is the best illustration of that very old adage "a chain is no stronger than its weakest link."

In order to obtain low weight without sacrificing strength, it is necessary to have maximum refinement in design. With the use of a riveted structure the various fittings and joints will in the majority of cases become quite complicated in form, thereby incurring considerable expense in their manufacture. Oxy-acetylene welding, on the other hand, will give the designer much more leeway, and joints can be made up at a fraction of the cost of machined fittings.

At the present time the chief use of welding in the aircraft industry is in the construction of the fuselage. The frame of the fuselage is usually rectangular in shape and is built up of a combination of simple trusses. At each point where the longitudinal members come in contact with the transverse frame a joint is made, either by riveting or by welding. A comparison of the two types of construction will quickly disclose which would cost the least to produce, not only from an experimental viewpoint, where only one or two planes of a given type might be constructed, but with mass production in mind.

The development of torch manipulation technique has been, without doubt, a major contributor to the success of welding in aircraft, but equal significance can be attached to the

NEW CINCINNATI HYPRO PLANER MILLER



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Other features of the Hypro Planer Type Miller:

Complete Electrical Control.
Independent Rapid Traverse to All Heads.
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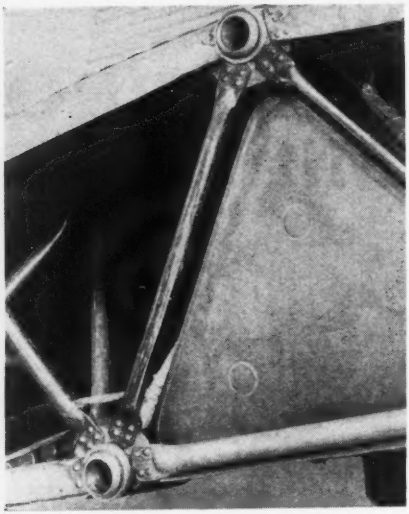


Airplane Section, Showing Riveted Type of Construction

development of welding jigs. The essential difference between the process of welding and other assembling or manufacturing processes is the extreme simplicity and low cost of welding jigs as compared with the production units of other processes or methods.

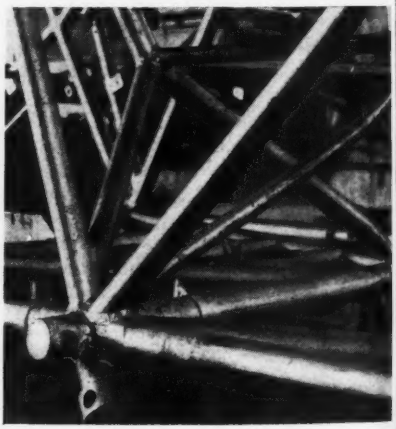
Mass production by means of processes other than welding necessitates the use of costly machine dies, painstakingly matched to each other for stamping, expensive and elaborate patterns for castings, high priced forging dies and costly assembling jigs for riveting and bolting. By way of contrast to these the welding process will permit of the use of simple mill material such as steel tubes, fabricated by the use of jigs built of standard steel shapes such as angles and channels.

One of the most important factors resulting from the use of a welded joint is rigidity. The material present works in tension as well as in compression, and therefore has lower average intensity of stress as well as a more uniform distribution in comparison with a riveted joint.

In aircraft construction it is of extreme importance that the welder know his business thoroughly, not only as a welder but particularly as an aircraft welder. Nothing can be more discouraging than to suddenly have an otherwise good job go bad because of the development of cracks in a welded joint. This difficulty was at one time taken as a matter of course and attributed to various and sundry conditions, but it has finally been concluded that the solution to the problem lies to a great extent in the hands of the welding personnel. It therefore behooves the aircraft manufacturer to retain trained men and to constantly check their work to see that it is kept up to standard.

In view of the extreme exactitude which governs the design and construction of an airplane, there are many features of welding which, while permitted in other industries, are prohibited in the manufacture of

(*Continued on page 61*)



Welded Joint in Section of Fuselage

Welding in Aircraft Industry

(*Continued from page 56*)

aircraft. Edge welding is avoided, as this is one of the most prolific sources of cracked welds known. The joint should not be loaded with surplus metal as this only means more weight and a better chance for cracking. Tension welds are avoided if possible. Two welds are not made too close together in thin gauge material because there is not enough metal available for proper stretching to meet the double shrinkage, and cracks will result. Both sides of a thin sheet should not be welded unless absolutely necessary. The practice of filling holes with weld should be discouraged. The use of any kind of welding rod should be prohibited; in the absence of specific instructions, low carbon steel rod is the best. Frequent inspection is of extreme importance and parts should occasionally be tested to destruction.

The materials now chiefly used in aircraft construction that are particularly adapted to welding are those coming within the scope of the aluminum alloy group and the ferrous alloys in the carbon steel and chromium steel groups. S. A. E. 1015, 1020 and 1025 bar, sheet and tube have been and still are being used extensively. Of late, however, there has been a decided change to the chrome molybdenum analysis corresponding to the S. A. E. X4130, because of the additional strength that may be obtained by air hardening from normalizing or welding temperatures.

With the use of this material it has been possible to raise the basis of the standard design strength from 55,000 lbs. per sq. in. to 95,000 lbs. per sq. in. This strength can be developed by normalizing, and will not be lowered by a subsequent welding operation.

Engine cowling, water connections and gas and oil tanks are usually constructed of commercially pure aluminum with welded joints — and this joint, by the way, is perhaps the most satisfactory of those capable of being produced in the aluminum alloy group. In fact, it has been demonstrated only recently that the principal strong alloys of aluminum such as duralumin, alclad, and so on, are available for welding, but the various objections have been overcome to such an extent that it is now possible to produce excellent welded joints in these materials by the use of a 4½ per cent silicon welding rod. This special welding rod is desirable in view of the fact that its melting point is lower than that of the alloy being welded, hence it will remain in the molten state after the base metal has solidified. This will permit the welding metal to fill in any voids that may have been created by the solidification contraction of the base metal. Furthermore, any stresses which might be caused by contraction will shift their effects from the base metal to the weld metal, which, being free from hot shortness, will absorb the stresses without the development of cracks.

In the case of heat treated alloys, such as duralumin, it might be assumed that if the whole subject were submitted to heat treatment after welding, the original strength could be retained. Such, however, is not the case, due to the fact that the metal in the weld is in the cast state and is therefore much less susceptible to heat treatment than the base material. The zones on either side of the weld which are partially annealed by the welding operation will, however, respond to heat treatment and regain the original strength value.

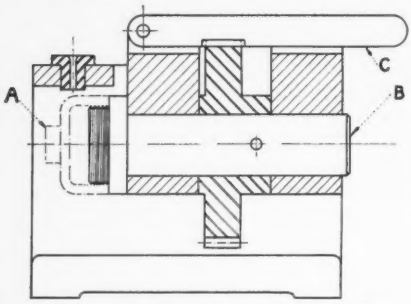
Ideas From Readers

This department is a clearing house for ideas. If there is a "kink" or short-cut in use in your shop, send in a description of it. We will pay $5 for each one published.

Using a Gear As An Index Plate

By A. R. KLING

THE writer was recently called upon for a jig to drill 36 holes in the nozzle indicated at **A** in the illustration. The jig was needed as soon as it could be made and while there were enough parts to warrant the use of a jig of some kind, the quantity was not large enough to cover the cost of an elaborate tool. Nor did we have the time to make one.



Drilling Jig with Gear Used as Index Plate

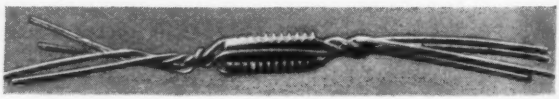
A search of obsolete stores brought to light an angle plate which could be used, and a bushing was selected from the stock of standard bushings. Means for holding the bushing in position was provided by attaching a plate to the angle plate, as shown. The spindle **B** was turned and threaded to fit the work, then two blocks were attached to the angle plate and bored to provide bearings for the spindle. The only other item necessary was a means of indexing, and this requirement was filled by borrowing a 36-tooth gear from a set of change gears which belonged to a lathe, and pinning it to the spindle. The gear was located between the blocks, as shown.

To complete the indexing mechanism, a latch **C** was hinged to the top of the jig, and the lower edge of the latch was formed to fit the space between the gear teeth. To index, the latch is lifted and the gear—with the spindle and work—is revolved by hand. Where absolute accuracy is not essential, there are many cases like this where standard gears can be used in place of expensive index plates.

Removing a Broken Tap With Music Wire

By BERT C. NAGY, JR.

HERE is a method of removing a broken tap from a hole which is simple and safe as it is unusual. This tap broke in an expensive die. I cut four pieces of music wire and slipped the pieces through the four flutes in the tap, leaving the ends to stick out



Piece of broken tap with wires by which it was forced out of a hole in a die

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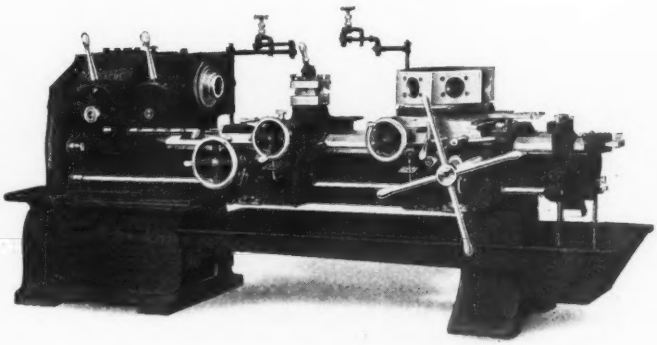


—those are the results you get with the use of the New No. 2 Cincinnati Acme Universal Heavy Type Turret Lathe. The features that make these results possible are:

Twelve reversible spindle speeds, all instantly available through two levers.

Roller bearing superior mounted spindle.

Roller bearing mounted transmission shafts.

Roller bearing outboard support for pulley.

Disc Clutch automatically disengages when shifting speeds.

Can be equipped with bar or chucking equipment, either being interchangeable without a great loss of time.

Can be furnished with either the Semi-Universal or Full Universal turret.

Write for Bulletin!

THE ACME MACHINE TOOL CO.

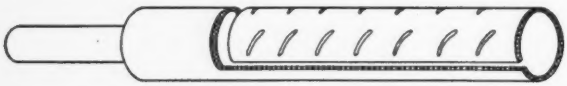
CINCINNATI, OHIO

of the die at either end of the hole. I then took two pairs of pliers and twisted the wires in the same direction at both ends, in the direction that would back the tap out of the hole. The tap came out without injuring the die. The piece of broken tap, with the wires twisted about it as it came out of the hole, is shown in the illustration.

An Unusually Good Lap

By F. J. WILHELM

THE lap illustrated in the drawing has been found to possess certain advantages which are not possible with the usual type of solid lap. The lap is made from a piece of tubing, sawed so that half of the tool will maintain alignment with the shank, while the other half can be sprung so that it will expand against the inside of the hole. Thus, while conforming to the diameter of the hole, the lap exerts pressure against the inner wall and so helps the abrasive to perform its function. The amount of pressure exerted can be governed by the amount of "spring" given to the free section.

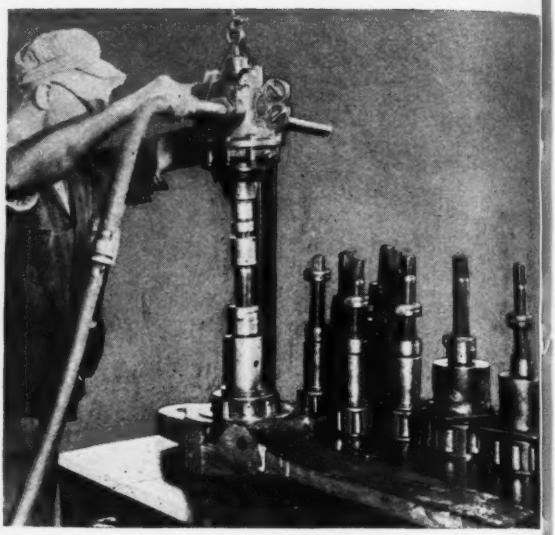


A Self-Expanding Lap

Rolling Rod Bushings

By JOHN MCCULLAGH

THE use of the rolling tool for expanding bushings to size and seating them in place after they have been assembled into the unit in which they are to be used is quite common in automotive manufacturing. This practice is also adaptable to locomotive work, as shown by the illustration herewith. Here a rolling tool is shown in use in the Wabash Shops, at Decatur, Ill., for rolling bushings in locomotive connecting rods to size.



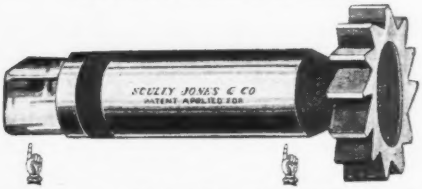
Rolling a locomotive rod bushing to size

The rolling tool consists of a holder that carries six hardened steel rollers, the diameter of the tool over the rollers being the desired hole-size. The hole is bored slightly undersize. Power is supplied by an air-operated motor, and the tool is forced through the bore as it revolves. The rolling action expands the bushing to the desired size, compressing the metal, removing the high spots, and producing a smooth surface. The operation can be handled rapidly, and it is claimed that a rolled surface wears longer than one that has been finished by machining in the usual manner. The

"Drive By the Square" "Center By the Shank"

Woodruff Keyway Cutters

WITH SQUARED SHANK



FOR use in connection with the "SCULLY-JONES" Woodruff Keyway Chuck, shown at the right, which "DRIVES BY THE SQUARE" and "CENTERS BY THE SHANK." This insures a positive drive and true-running cutter at all times, and eliminates the making of collet chucks. Any mechanic will appreciate what that means in his work.

THE "SCULLY-JONES" CUTTER CHUCK

For Driving
Woodruff Keyway Cutters, End Mills, Etc.

Is made in one piece, hardened and ground. There are no screws to adjust and no parts to become lost in the shop. It fits all spindles of the standard makes of milling machines, and is made in Morse, Brown & Sharpe and Jarno Tapers.

The efficiency, accuracy, convenience and economy of "SCULLY-JONES" Woodruff Keyway Chucks and our Squared-Shank Cutters will so appeal to you and your workmen that if you use them once you will never willingly be without them.

Detailed specifications in our Small Tool Catalog No. 36, which describes our complete line of "WEAR-EVER" PRODUCTION TOOLS, will be gladly sent on request.

SCULLY-JONES & CO.

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L. C. Biglow & Co., Inc.
250 W. 54th St.

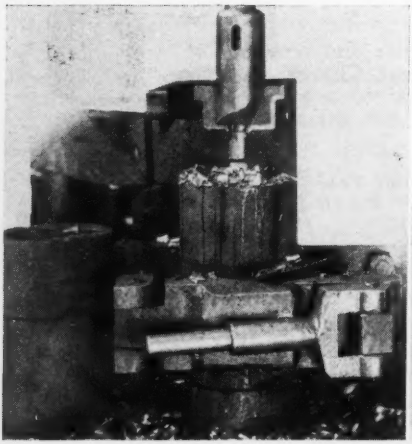
rolling operation can be applied to motion work as well as rods, as holes up to 12 inches diameter are finished with these tools.

Tools For Machining Locomotive Crank Pins

By J. H. HAHN

LOCOMOTIVE repair shops where special equipment for machining locomotive crank pins is not available, or where a small number of crank pins are made at intervals, will find the tools shown here very useful. This equipment consists of a special tool for recessing, with a fixture to hold the pins.

The stock is first sawed to length in the cold saw, the pins shown being 11½ in. long. Each piece is then centered in both ends. A 1-3/64-in. hole is drilled four inches deep in one end of the pin, and, after recessing, this hole is tapped 1¼-in. to receive the collar bolt that holds the crank pin collar on the pin. The recessing operation is performed with a special tool that is 2¾ in. diameter and 2¼ in. deep, with a pilot 1-1/32 in. diameter. This tool also faces the top of the pin. The fixture is of the quick-operating type, the clamp being locked in place by means of a cam-action lever. The center of the clamp is shaped to form a Vee, as shown. The pins are also tapped in this fixture, using the drill press to drive the tap. The pins are finished complete in this operation with the exception of turning.



(Left)—Fixture with piece in position for recessing. The tool can be seen above the work. (Below)—The pin at left is finished; the other is partly finished.

Combining Machining Instructions With the Dimensions

By C. G. CROWLEY

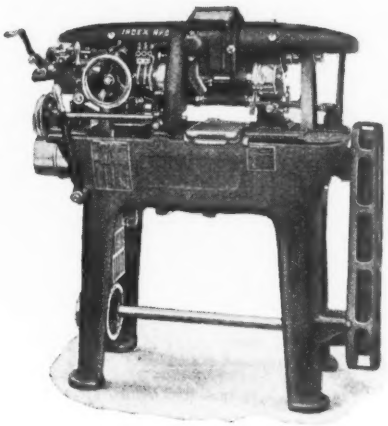
ON many classes of work, several different ways of performing each operation exists. Where work is done on contract and where conditions are similar to those usually existing in the contract or jobbing shop, where the discretion and judgment of the individual doing the job has greater leeway, it becomes increasingly important to conform to the plans of those who draw up the original proposal. Otherwise, production costs may exceed the estimate and the promised profit may turn out to be an actual loss. When important proposals are being drawn up, it is often the custom for department heads to get together and discuss the opera-

Maximum Screw Machine Production

Guaranteed On the Index-O

HIGH PRODUCTION AUTOMATIC SCREW MACHINE

Maximum Chuck Capacity, $\frac{7}{16}$"



Maximum Feeding Length, 1¼"

The Index-O is designed to obtain the maximum cutting speeds of the new steels and cutting materials.

It is built especially for High Speed Production.

It will operate at higher speed with less vibration, wear and tear than any similar machine.

It is exceptionally economical on short runs, due to a standard cam system.

It takes less time to set up on the Index-O.

Send your blue prints for production estimates—without obligation.

INDEX MACHINERY CORPORATION

49 CENTRAL AVENUE, CINCINNATI, OHIO

tions to be used and to figure the time and cost per operation.

When it is time to do the job, however, some of the department heads may be absent and the original plans may go astray, with the result that the job is done differently. To get away from this difficulty, one large contract shop employs a very simple yet effective way of handling the situation, which assures every operation going through as planned.

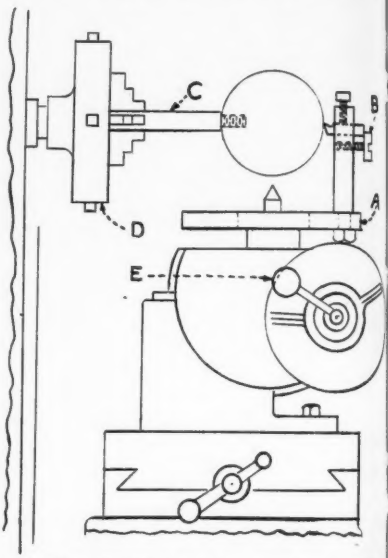
A rubber stamp has been made, the design consisting of a number of rectangular spaces. This stamp is put on all working drawings at the bottom, on the right hand side. In the spaces are written such instructions as the peculiarities of the methods for the various operations, the cutting speed, the rate of feed, the gages required, specifications as to other tools, and so on. This information is the result of conferences among the various department heads, and is, of course, carefully checked before blueprints are made and before the job goes into production.

There are many advantages in this system. The information is on the drawing instead of on the production cards, thus reducing the amount of clerical work necessary. The information is where it is wanted and where it can be used. Mistakes in taking instructions or typographical errors are eliminated. Misunderstandings and mistakes are less likely to occur through haste, absenteeism, change of operators, and so on. Above all, the instructions go with the job and stay with the job, regardless of who does it.

Turning a Ball In the Milling Machine

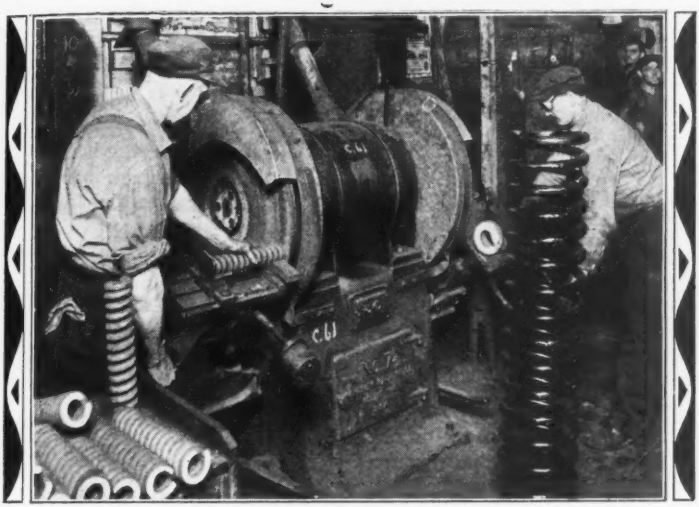
By CHARLES KUGLER

THE writer recently machined a brass ball by turning it in the milling machine, producing a better job than he has ever been able to turn out by using the lathe. The workpiece was drilled and tapped for the arbor shown as **C** in the illustration, and the arbor was securely clamped in the jaws of the chuck **D**. An indexing head **A** was mounted on the table of the machine and a tool holder



Milling Machine Set Up to Turn a Ball

was mounted on the driver, as shown. The tool holder was provided with a screw having a large head, **B**, which was used to adjust the tool for depth. (It might be possible to omit this screw). The tool was rotated about the work by turning the crank **E**, which is a much easier task than pushing a compound rest—as is necessary when a lathe is used for this job. In setting up to use this method, it is necessary to locate the table so that the center line of the index head will be in line with the center line of the milling machine spindle.



INCREASING production *by* REDUCING manual effort

THE trend in modern shop practice is to reduce manual effort in machine operation; to eliminate the human element as a production factor insofar as it is possible to do so.

Gardner Engineers have carried out this principle in many ways, but in none more effectively than in the design of the NEW POWER-OPERATED WORK TABLES for use with almost ANY STANDARD DISC Grinder.

On the heavy coil springs shown here, with stock removal sometimes as great as ¼" over a good sized area, purely manual operation would slow up production to a marked degree.

With GARDNER POWER-OPERATED WORK TABLES, however, the operator merely loads and unloads his fixture, thereby materially increasing production, which is furthermore CONSTANT and UNVARYING.

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Semi-Automatic
DISC GRINDERS
High Production—Less Labor

GARDNER POWER-OPERATED WORK TABLES WILL INCREASE PRODUCTION ON MANY FLAT SURFACE JOBS—
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Specialists in Grinding Equipment
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Across the Desk with

HOWARD CAMPBELL, *Editor*

NOISE and its effect upon those who are within hearing distance is coming in for an increasing amount of attention. No conclusive amount of research has been made as yet, but such laboratory tests as have been made by individuals have produced results of sufficient interest to focus a considerable amount of attention upon the subject. It has been found that industrial noises, such as the racket caused by air-hammers or the clatter of badly-fitted or badly-worn gears, tend to distract the attention of workers in the vicinity and lower production. The best and fastest workers are usually the most intelligent, and the more intelligent a person is, the more sensitive his nervous system is likely to be. He may overcome the effects of distracting noises by more intense concentration upon his task, but such concentration is more tiring, with the same ultimate result—less production. From the amount of attention this subject has been receiving of late, it is evident that an organized effort will be made shortly to determine just what the effect of noise is upon production. In thousands of cases, industrial noises could be reduced by the use of composition gears, better bearings, and so on. Perhaps the translation of noise into dollars and cents will have the result, at least, of making our factories better places in which to work.

ALTHOUGH still somewhat wobbly from its head-on collision with the stock market, business is slowly recovering and, from all indications, will soon be carrying a normal load again. The automobile industry, which is so important a factor in steel and many other industries, is stepping up production in anticipation of a volume of sales which, it is calculated, will fall but little short of last year's record.

The General Electric Company booked more orders for electrical equipment in the last quarter of 1929 than in the same period a year previous, and the Western Electric Company's unfilled orders December 31st were the largest in the company's history. Allis-Chalmers Manufacturing Company had unfilled orders on January 1, 1930, of $13,039,000, compared with $9,000,000 on January 1, 1929. The Frigidaire Corporation reports that its sales quotas will be larger this year than last, and states that there has been an upswing in January orders.

Railroad freight cars on order January 1, 1930, amounted to 34,581, which compares with 13,036 on January 1, 1929, and is the largest for any corresponding date in four years. In the shipbuilding industry, vessels under construction in United States yards at the beginning of 1930 totaled 179,062 gross tons, compared with 48,000 tons at the beginning of 1929—an increase of 273 per cent.

The increase in business is reflected in employment figures given out by the United States Department of Labor, which showed a distinct upturn during the first two weeks of January. The gains were large, amounting to 3.4 per cent in the week ending January 6th and 3.3 per cent in the week ending January 13th.

FOSDICK

High Speed Ball Bearing Sensitive Drill

—"Gangs" up to 6 Spindles—

SENSITIVE **ACCURATE**
RIGID **ADAPTABLE**

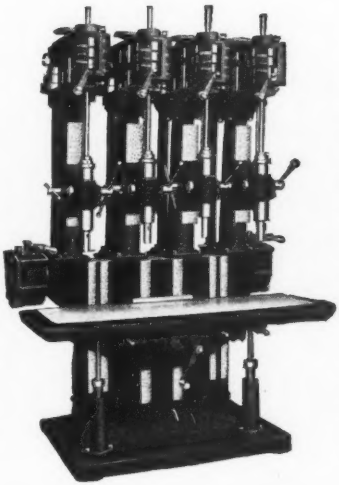
Ball Bearings on al revolving parts.

Spiral Gear Drive; hardened spiral gears running in oil.

Patented Belt Shifting Mechanism, using a central cam drum, controlled by crank.

Four-cone pulley gives four speeds. Range of three sets of speeds to choose from.

Channel for chips and lubricant around table.



Spindle of Chrome Nickel Steel, accurately ground.

Spindle Sleeve is supplied with one thrust and two radial ball bearings.

Head is adjustable and can be clamped in position.

Power Feed. Four geared feeds for each spindle. Feed-engaging clutch and all gears are enclosed.

Patented Tapping Attachment is clamped to quill or sleeve and is disc-driven.

Developments far ahead of general practice in building machines of this type are embodied in the design on this machine. Especially intended for use on the rapid, accurate drilling operations met in modern high-production manufacturing plants.

Ask For Specifications

THE FOSDICK MACHINE TOOL CO.

CINCINNATI, OHIO, U. S. A.

New Shop Equipment

General Radial Drill Company Brings Out Two Radial Drills

The General Radial Drill Company, 1769 Elmore Street, Cincinnati, Ohio, has brought out two new radial drilling machines, both of which incorporate methods of construction that are new as regards their application to radial drills. The machine illustrated on this page is

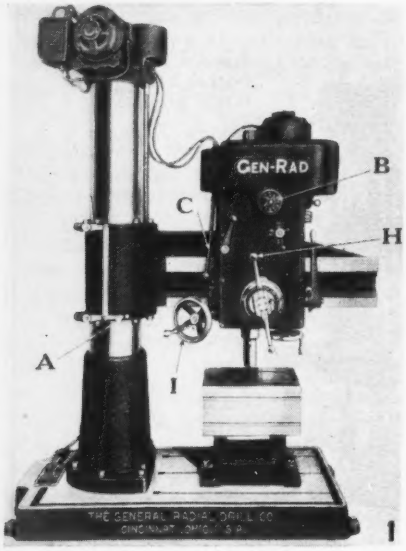


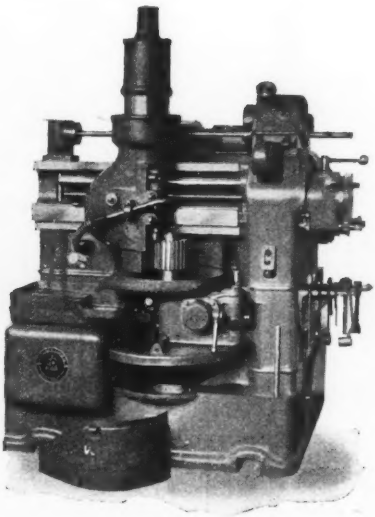
Fig. 1—"Gen-Rad" Radial Drilling Machine.

known as the "Gen-Rad," the name being derived from the fact that the machine is intended for general purpose work. This machine is built in two sizes, with column diameters of 9 in. and 11 in., with 3 ft. and 4 ft. arms, and will handle drills up to 2 in. diameter.

The machine is equipped with two motors, one at the top of the column for raising and lowering the arm, and the other at the top of the head to drive the spindle and provide power for operating the feed mechanism. Electric power is brought to the base of the column, where it is introduced through a revolving connection which maintains contact as the column swings with the drill arm. Power for raising and lowering the arm is carried through a worm and worm wheel, the worm wheel being engaged by a positive clutch keyed to the elevating screw. The clutch constitutes a safety device in the event that the vertical movement of the arm is blocked.

The column of the machine is of tubular construction, consisting of an inner and outer tube cast integral with web connections. The barrel on the arm, although not split, completely surrounds a sleeve which is a slip fit on the column. Ball bearings at the top and bottom of this sleeve facilitate the rotation of the arm and barrel. The arm is clamped to the column by means of split rings at the top and bottom of the barrel, the rings being keyed and bolted to the barrel at its point of junction with the arm. The remainder of the bolts which hold the clamping rings in place on the barrel are a clearance fit allowing sufficient movement for the manually-operated clamps **A** to bind these split rings accurately to the column.

The spindle is driven by power supplied from the motor at the top of the head, transmitted through a patented Gibbs V-Disc Transmission. In this transmission, which is shown in Fig. 2, a disc that is mounted on the motor spindle engages with the lower disc, shown at **A**. By changing the position of the idler between the sheaves, any one of 12 speeds can be obtained and, by changing the diameters of the steps in the two sheaves, the 12 speeds can be arranged in groups covering ranges from 78 to 3,000, according to requirements. Figure 1 shows a star wheel **B** mounted on the front of a graduated dial. This star wheel is carried on a short shaft **B** in Fig. 2. By pulling this star wheel forward, the idler is drawn out of engagement with the sheaves and by turning the star wheel to bring the arrow into position for the required speed, the



A Production Gear Shaper

For Gears up to 18-inches Pitch Diameter

THIS new 6A-type Fellows Gear Shaper is adapted to a large range of work. It is of extremely rigid construction and is therefore adapted to heavy-duty work, and at the same time produces gears of extreme accuracy.

Manufacturers who require a machine for general gear cutting will find in the 6A-type Gear Shaper an ideal combination of adaptability and accuracy.

Complete specifications and description will be sent upon request. Ask for copy of booklet No. 16.

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Head Office and Works: **78 RIVER STREET, SPRINGFIELD, VERMONT**

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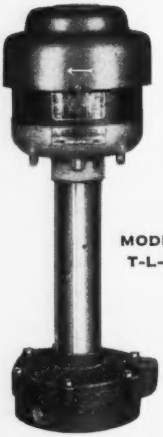

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idler is ready to engage the required steps on the sheave when the star wheel is pushed back. An index pin locks the star wheel and the idler disc in the desired position.

From the driven sheave, power is transmitted through bevel gears between which a clutch, operated by lever C, Fig. 1, is located. This mechanism pro-

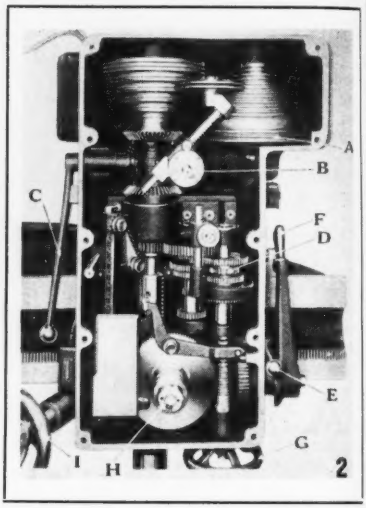

Fig. 2—View of Mechanism of Gibbs V-Disc Transmission used in "Gen-Rad" Radial Drilling Machine.

vides for forward or reversing movements for tapping operations. Power is carried to the feed mechanism through a pair of gears. From Fig. 2, it will be seen that this mechanism is the familiar arrangement of sliding gears which provides either of seven changes of feed, ranging from .006 in. to .037 in. per rev. The power feed is engaged by a clutch operated by lever **E**. For the performance of sensitive drilling operations this clutch may be disengaged and the spindle fed by hand by lever **F**. The drill is advanced to the work ready to start feeding by means of handwheel **G**, and rapid adjustments of the spindle position are accomplished by hand levers carried on the shaft shown at **H**, Figs. 1 and 2. Traverse of the head on the arm is accomplished by a rack and pinion operated by a handwheel shown at **I**, Figs. 1 and 2. Push button controls on the head govern both motors.

Both will do the job...
But One Saves $25,000 a year!

This simple assembly made by the leading manufacturer of automotive hardware proves that it pays to pick screws carefully when you have a fastening job.

One would think that any screw would do to fasten end brackets to steel rods in assembling these robe rails and foot rests. And any screw will do the job. But one is so much easier to use that it reduces the cost of the fastening 44%. A certified cost study* of this assembly shows that a saving of $25,321 a year was made simply by using Hardened Metallic Drive Screws instead of machine screws. And the fastenings are just as secure.

Hundreds of manufacturers try Hardened Metallic Drive Screws *first* when an assembly requires a permanent fastening to iron, brass, aluminum, steel, Bakelite, etc. Experience has shown them that no other means of making *secure* fastenings is so easy, speedy and cheap.

You merely hammer this unique Screw into a drilled or formed hole. It cuts its own thread in the material . . . makes a better fastening than a machine screw—a fastening that will not loosen under vibration and severe service.

If any of your fastenings can be made with these screws you can save time, labor and money. Check up on your assemblies. Then use the coupon to obtain proper samples for a test on your own work.

**Facts and figures given are from a survey made by independent engineers and approved by the maker.*

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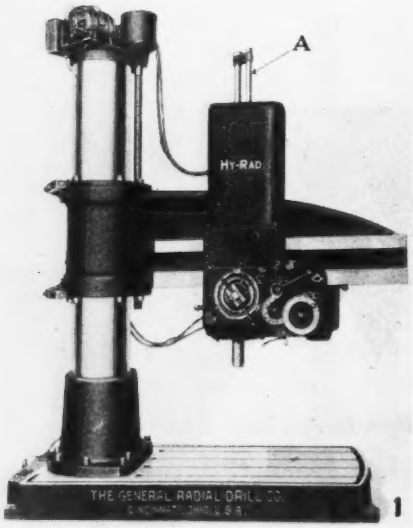
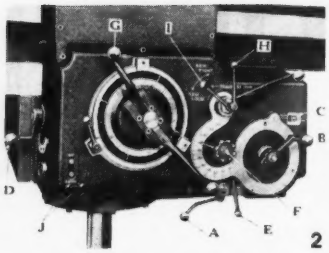




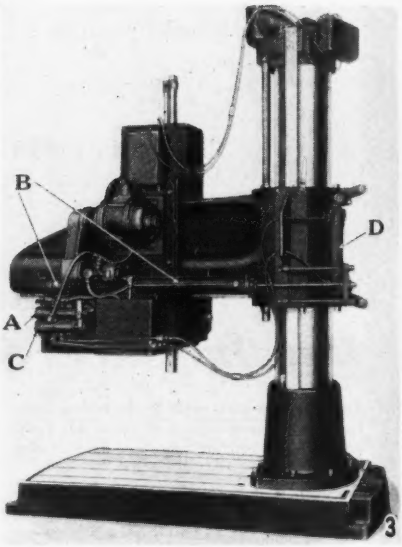
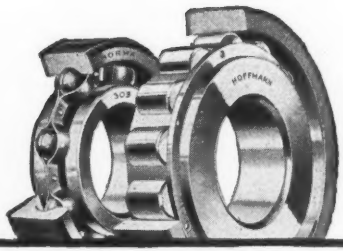


Fig. 1—"Hy-Rad" Hydraulically-Operated Radial Drilling Machine. Fig. 2—View of Head Showing Control Levers of "Hy-Rad" Radial Drilling Machine. Fig. 3—Rear View of "Hy-Rad" Machine.

"Hy-Rad" Radial Drill

The second of the two radial drilling machines which have been brought out by the General Radial Drill Company, 1769 Elmore Street, Cincinnati, Ohio, is equipped for feeding the spindle, traversing the head on the arm, and for clamping the arm to the column by means of hydraulic pressure. The machine is built in column diameters of 15, 17 and 19 in., with arms from 4 ft. to 8 ft. The method of connecting with the power lines, the construction of the column and provision for raising and lowering the arm on the column, and the design of the barrel with provision for clamping are the same as is used with the "Gen-Rad" radial drill, excepting that, on the "Hy-Rad," the arm is clamped to the column by hydraulic power. It is claimed by the builders that the use of hydraulic feed for the spindle makes possible the double advantage of greater uniformity of feeding movement and greater flexibility and control of feed, insofar as an unlimited graduation of rate of feed is concerned and also in the ability to quickly adjust the feed to compensate for variations that may occur in the hardness of the material being drilled.

The illustrations will show that there is an electric motor mounted at the back of the drilling head. This motor serves the double purpose of driving the pump which furnishes hydraulic pressure and also of driving the gears with which the speeds are changed. Power is transmitted from the motor by chain to two sprockets on individual free-running shafts, a clutch that is operated by lever **A**, Fig. 2, providing means for locking either sprocket to the shaft to obtain forward or reverse rotation. The shaft extends into the head and connects with a set of sliding spindle-speed gears which can be shifted by the use of the lever **B**. Twelve speed-changes are



PRECISION

its meaning and its commercial value

PRECISION, as commonly used, is a term defining extreme refinement of dimension and finish. But as describing an outstanding quality of *NORMA-HOFFMANN Precision Bearings*, the word has a far more comprehensive meaning.

To Norma-Hoffmann engineers and production men, *Precision* means the ultimate in dimensional refinement. Above and beyond this, however, it means bearing design worthy of expression in a finished product of this extreme refinement—selected materials well deserving of special treatments and of highly refined machining processes—standards of production which permit no deviation from absolute uniformity, regardless of quantity.

Precision, as thus described, is the foundation quality upon which the Norma-Hoffmann reputation rests, upon which its business has been built, and upon which it must continue to grow.

But what does all this mean to the buyer and user of *NORMA-HOFFMANN Precision Ball and Roller Bearings?* What, in other words, is the commercial value of *Precision?*

Briefly stated, *Precision* stands for that combination of qualities which manifests itself in higher anti-friction efficiency, longer life, greater speedability, better performance, lower costs for replacements, increased production. These are the distinct and concrete advantages which accrue to the user of *NORMA-HOFFMANN Precision Bearings.*

Obviously, *Precision* is costly to produce and to maintain. But it has been the uniform experience of those who have availed themselves of its advantages, that its price is repaid a hundred fold in the lower after-costs which inevitably follow.

The long, varied experience of Norma-Hoffmann engineers is offered without obligation to machine users and builders facing bearing problems.

"NORMA-HOFFMANN"

PRECISION BEARINGS

NORMA-HOFFMANN BEARINGS CORPN.—STAMFORD CONN. U.S.A.

JIM K28 JIM K29

available, as indicated by the direct-reading dial **C**, Fig. 2, without moving lever **D**. By shifting lever **D**, the selective gears on the spindle are shifted, thus making available a total of 24 speeds. The spindle speeds range from 20 to 1058 r.p.m., but any range desired can be furnished.

The piston for hydraulically feeding the spindle is mounted directly at the top of the spindle where it is free to rotate on anti-friction bearings. Lever **E** in its neutral position closes the valve which admits pressure to the cylinder. By moving the lever to the left, pressure is applied for feeding the spindle downward; by moving it to the right, pressure is applied to move the spindle upward. The rate of feed is governed by the starwheel **F** and an indicator needle which shows the rate of feed in inches per minute. The feed range is from 0 to 100 inches per minute.

Provision is made for moving the spindle up or down by hand, when necessary, by means of "breaker" levers **G**. These levers operate on a sliding shaft which can be pulled outward, thus closing the valve in the cylinder. The spindle is counterweighted to facilitate hand movement.

The rear view of the machine, Fig. 3, shows a valve **A** which provides for admission of pressure in either direction in cylinder **B** to traverse the head on the arm. This traverse movement is controlled by lever **H**, Fig. 2. The speed with which the head is traversed is governed by the distance this lever is moved, thus making it possible to move the spindle rapidly toward the desired position and then slow down to the exact point of location. In Fig. 3 can be seen a second valve **C** which controls admission of pressure to cylinder **D**. The piston rod in this cylinder is connected with toggles which actuate the upper clamping ring, the cylinder being connected to a similar toggle on the lower clamping ring. When pressure is admitted to the cylinder, both toggles are actuated, locking the barrel rigidly to the column. Pressure is controlled by lever **I**, Fig. 2. Push button control is provided, as shown at **J**, Fig. 1.

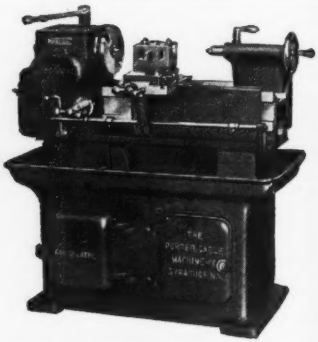
Hammond Type "C" Rite-Speed Electric Polishing and Buffing Lathe

The illustration shows the Type "C" Rite-Speed Electric Polishing and Buffing Lathe which has been brought out

INDUSTRY *reaches for the*

CARBO-LATHE

FOR TUNGSTEN CARBIDE TOOLS



because it gives performance that is unusual. The new CARBO-LATHE has the rigidity to withstand multiple tooling-power and speed called for by faster cutting, besides a Timkenized spindle and anti-friction bearings. Send for booklet entitled "Turning with Tungsten Carbide"—free.

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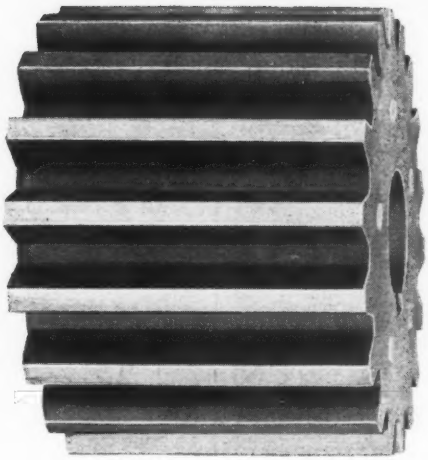

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Every year for many years the amount of Formica gears used both in production and maintenance of machinery has shown a steady increase.

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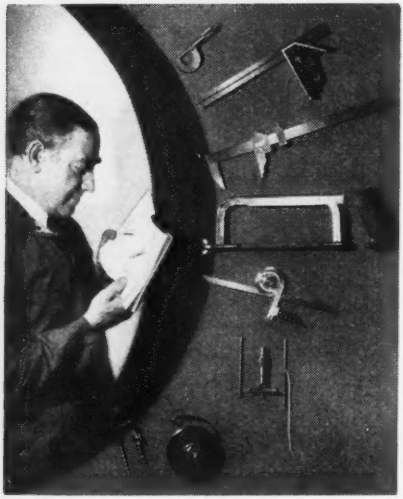

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Gentlemen: Please send me my copy of Starrett Catalog No. 25 "MD." My occupation is (please check one): Machinist ( ); Toolmaker ( ); Diemaker ( ); Executive ( ).

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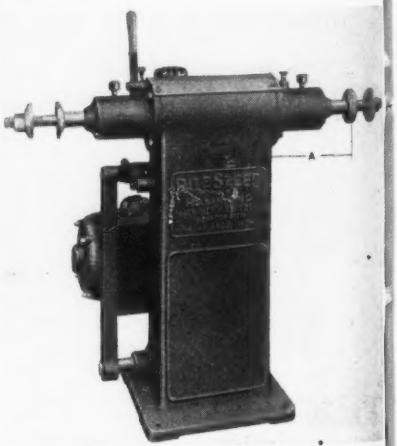
by the Hammond Machinery Builders 1622 Douglas Avenue, Kalamazoo, Mich. The usual polishing speeds of 2,000 to 2,400 r.p.m. and buffing speeds of 2,400 to 3,000 r.p.m. are all available on this machine by simply changing the pulley on the motor. Power is transmitted from the motor to the spindle by means of the multi-V belt drive, which is silent non-slipping and long-lived.

The method of mounting the motor on the rear of the pedestal makes it possible to obtain the usual amount of working space with a minimum of floor space. A saving of from 8 to 15 in. is made on the width of the machine and, therefore, on the overall length of the spindle, by mounting the motor at the rear instead of inside the pedestal, without sacrificing clearance (indicated at A) around the spindle. The motor is totally enclosed, fitted with an air cleaner which prevents the dust and dirt from entering the motor windings, and can be adjusted for belt tension by means of a single adjusting nut without disturbing the mounting. Provision is made for unlimited radiation.

An outstanding feature of this machine is the ease with which belts can be changed. By removing the four large cap screws on each side of the



Hammond Type "C" Rite-Speed Electric Polishing and Buffing Lathe

spindle, the entire spindle can be removed from the pedestal without disturbing the bearing mounting or subassembly parts. The motor adjustment

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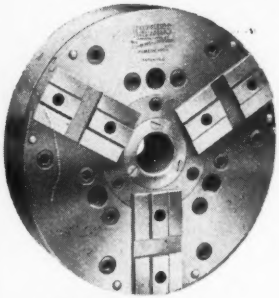
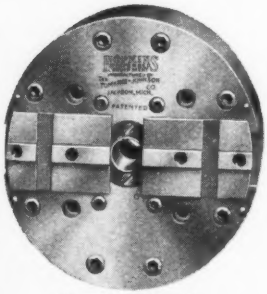


Three-Jaw Chuck



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Ask us to send our nearest man NOW.

Pneumatic Chucks

These chucks are available in a variety of sizes. They hold the work nearer spindle bearing with greater gripping power, increasing production and reducing vibration and wear on machines and tools. Dust-proof. Jaw-operating mechanism, by reason of greater bearing surface, insures g r e a t e r centering precision for second operation.

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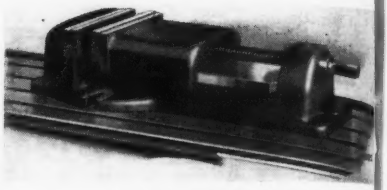
screw is then loosened, taking the tension off the motor pulley, and the belt slips off the spindle.

The combination switch and brake as shown is a new feature on all Hammond Rite-Speed polishing machines. With this design, it is only necessary for the operator to pull the lever forward to break the current connection and apply the brake. The brake is released and the motor started by reversing this operation. Either Timken Tapered Roller or Ball Bearings, automatic motor starter, flat-top threads, and spindle lock are all standard equipment on this machine, and the machine can be supplied with any standard motor specifications within a complete range of sizes of from 3 to 15 h.p. capacity.

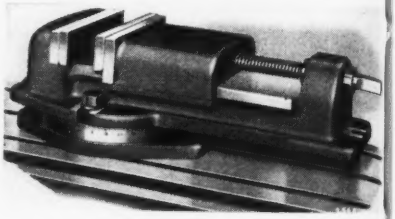
Cincinnati Plain and Swivel Vises

The Cincinnati Milling Machine Co., Cincinnati, Ohio, has augmented its line by the addition of newly-designed plain and swivel vises, in both No. 3 and No. 5 sizes. The general design of the vises has been improved and the vise has been strengthened throughout, particularly at the critical points, such as the fixed jaw



Cincinnati Plain Vise

section and the abutment which form the support for the screw that moves the moveable jaw or slide. The jaws are



Cincinnati Swivel Vise

of hardened steel and are securely held to the vise body and slide.

The bottom of the plain vise is fin

THE MOST COMPREHENSIVE AND FINEST EQUIPMENT IN THE WORLD—
is located in this wonderful plant. Here are made the finest of small precision tools, gages, and the like, for production and inspection work.
Manufacturing concerns all over the world are benefiting from the use of these time and labor saving tools —ARE YOU?
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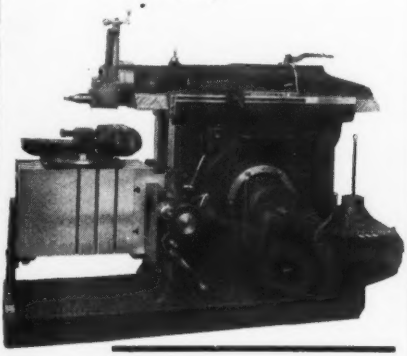
INDUSTRIAL LEADERS
CHOOSE
Columbia Shapers

SUPPOSING you went through some of the country's leading industrial plants as well as some of the smaller shops and found the same make of shaper used in these shops. Wouldn't you feel that this shaper must be getting results?

For more than twelve years the Columbia Superior Shaper has been increasing production and cutting costs for such industrial leaders as Haynes Stellite Company, General Electric Company, New York Central Railroad, as well as scores of smaller plants throughout the country. The husky construction, centralized control and longer stroke are just a few of the features which make improved results possible.

There are many more features described in bulletin 17. Be sure you get your copy. Send for it Today!



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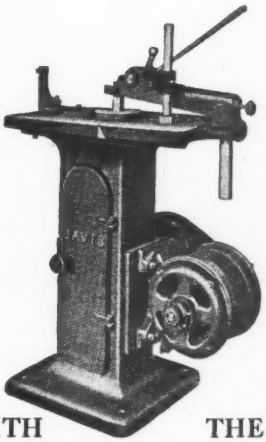

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TWO MINUTES is all that is required to set up the Davis Keyseater. It is always ready for any job up to 1" wide in parts up to 12" high. It cuts straight or tapered keyways with equal efficiency.

Speed, operating convenience, and accurate results on production, short runs, or special work are profitable features which you cannot afford to overlook. Investigate these features today.

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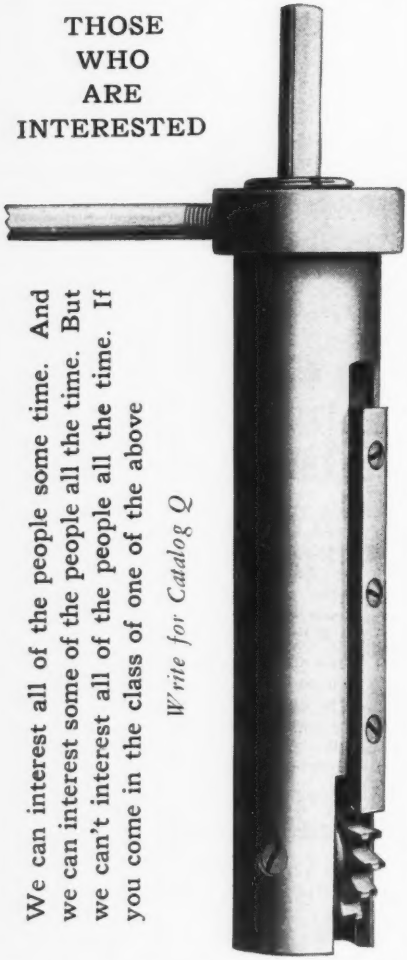


We can interest all of the people some time. And we can interest some of the people all the time. But we can't interest all of the people all the time. If you come in the class of one of the above

Write for Catalog Q

National Machine Tool Co.

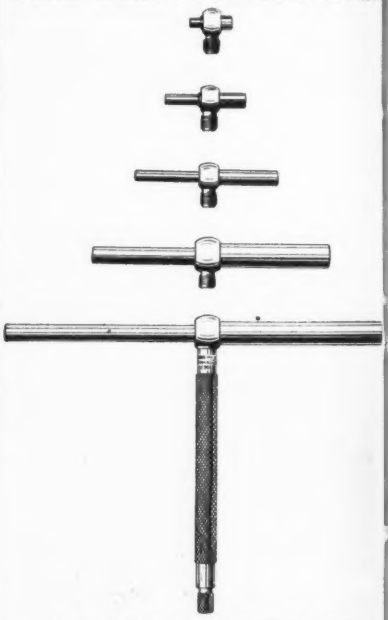
2271 Spring Grove Avenue

CINCINNATI, OHIO, U. S. A.

ished so that it can be converted int a swivel vise by merely assembling it t the swivel base, which is graduated in degrees. The No. 3 plain and swive vises have jaws 6⅛ in. wide by 1⅝ in deep with a 4-in. opening, while the No 5 vise in both styles has jaws 8⅝ in wide by 2½ in. deep with a 7-in. opening The swivel vise forms part of the regu lar equipment with the Cincinnati uni versal milling machine, and the plain vise with the plain and vertical ma chines.

B. & S. No. 590 Telescoping Gage

The Brown & Sharpe Manfg. Co., Pro vidence, R. I., has announced a new too for use with a micrometer to determin internal dimensions that have heretofor



B. & S. No. 590 Telescoping Gage

been difficult to obtain. The tool is known as the No. 590 Telescoping Gage and comprises five heads which are in terchangeable on one handle. The tele scoping head is inserted into the hole or slot to be measured, where it expands upon release, to the size of the hole. A turn of the knurled screw on the end of the handle locks the head and the gage

AMERICAN V-2 Broaching Machine

SMOOTH - POWERFUL
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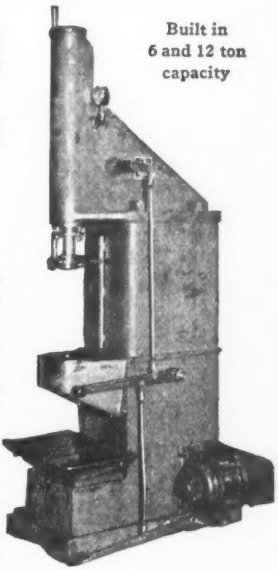

Built in 6 and 12 ton capacity

HYDRAULIC PRESSURE is smooth acting, positive, and powerful—the ideal for accurate broaching. That is why the American V-2 Broaching Machine is equipped with hydraulic feed.

It gives the ram a steady, smooth, downward stroke, and at a speed of 20 feet per minute has enough reserve power, up to 6 tons, to complete the stroke at this speed. As soon as the stroke is completed the ram automatically returns to the starting position.

This feature and many others are completely described in our bulletin—write for it TODAY!

The American Broach & Machine Co.

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The ROCKFORD *"Economy"* LATHE

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SATISFACTORY PERFORMANCE of Rockford "Economy" Lathes already installed—new features in the present design—low price for a lathe of this high quality and accuracy. These are three of the factors which caused the general manager of a tool and die shop* in New York State to order six more Rockford "Economy" Lathes.

A repeat order, placed for the reasons given above, is evidence of the great value in Rockford "Economy" Lathes which deserves serious consideration. If you are in the market for a general purpose engine lathe, write today for the latest circular on the improved Rockford "Economy" Lathes.

**Name furnished on request.*

ROCKFORD MACHINE TOOL COMPANY

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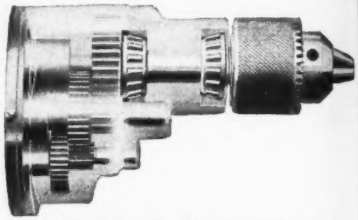
is then removed and measured with a micrometer to obtain the desired dimension. Each head is a self-contained unit; thus there are no parts to become mislaid or lost. The measuring surfaces of the heads are ground on a radius, adapting the tool for use on curved surfaces.

Ironite

The Kinite Corporation, Milwaukee, Wis., announces the development of a new alloy iron known by the trade name of "Ironite." It is said that Ironite provides, in a less degree, the advantages of Kinite, but at a lower price. Ironite possesses a close, uniform grain and toughness which gives it unusual abrasive and compression resistance, but it does not wear as long as Kinite. The metal is cast to shape, thus saving machining and permitting dies to be cast in one piece which, if forged, would have to be made in sections. Ironite is an electric furnace iron in the composition of which chromium, vanadium, and nickel play an important part. It is recommended for use in the manufacture of forming dies, machine parts, or in other cases where a close-textured, tough alloy iron is needed.

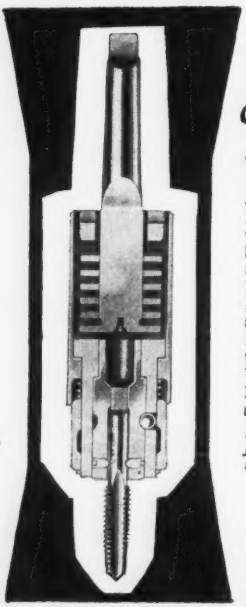
U. S. Drills Now Have Roller Bearings In Both Ends of Chuck Spindle

The design of the ⅝-in. and ¾-in. heavy duty portable electric drills manufactured by the U. S. Electrical Tool



Spindle of U. S. Electric Drill with Two Roller Bearings

Co., 2471 West Sixth Street, Cincinnati, Ohio, has been improved by the addition of a second roller bearing in the chuck spindle. The spindle now has roller bearings at both ends, as shown in the illustration. The primary object of this improvement is to provide for the double thrust which occurs when the tool is used for cylinder honing or other similar



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YOU can set an Apex Friction Chuck in advance to a predetermined slipping point—ELIMINATING THE HUMAN ELEMENT.
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With the Apex free floating tap collet the tap absolutely follows the hole and produces holes to exact size.

Also floating tool holder, quick change chucks, universal joint, universal joint nut setters, floating tap sleeves, stud setters, nut setters, etc. New Catalog No. 6 now ready.

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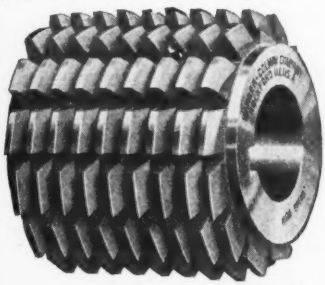

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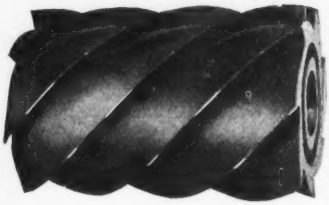

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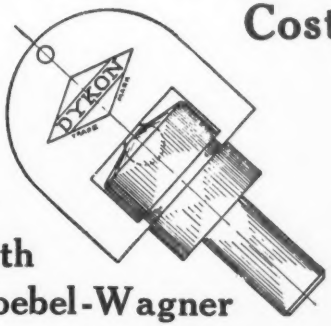

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ARE your precision grinding wheels doing precision work . . . or, are they dull and unevenly worn? The point is that unless you keep them true and smooth, precision work cannot be obtained at reasonable costs!

Koebel-Wagner Diamonds will true your wheels better — quicker — and with less waste. Each diamond is set in a Safety-Mounting which securely holds the stone in place and prevents loss. These diamonds are protected against abuse by the "Dykon" Gage. This is a small Koebel-Wagner Device which indicates at once when the diamond is worn to its lowest level and requires resetting.

Scores of leading manufacturers thruout the country have found that the use of Koebel-Wagner diamonds lowers their grinding costs and gives better results. These diamonds will lower your costs as well . . . let us show you how . . . send the coupon TODAY!

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Safety in lifting heavy loads is good insurance. Safety is what you get when you invest in UNION Hoists.

Features which make UNION Hoists safe are:

All Steel Suspension

Reversible Load Chain Sprocket

Solid Alloy Steel Load Shaft on Roller Bearings

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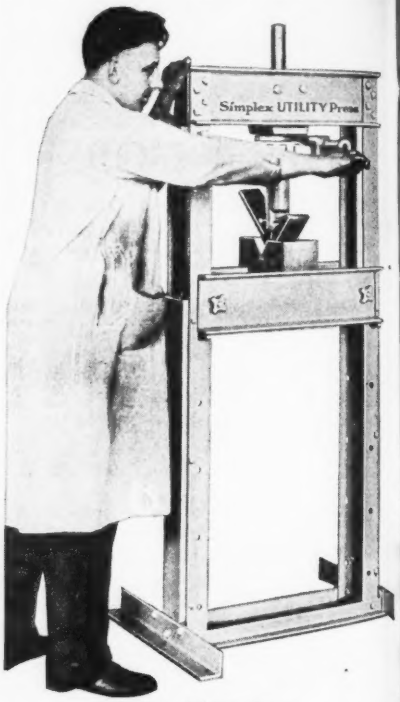
work. The additional roller bearing provides for ease of operation, regardless of the direction of thrust, and increases the life of the drill.

Simplex Utility Press

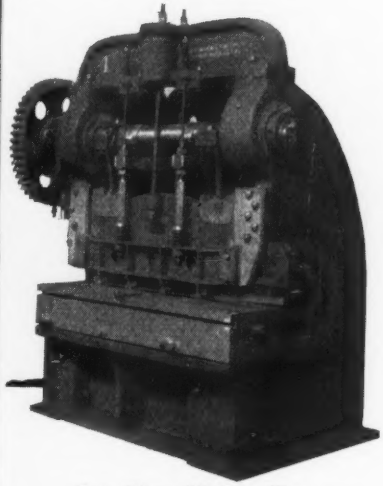
A hand press with which pressures up to 80,000 lb. can be obtained has been placed on the market by the Simplex Tool Co., Worrall Street, Woonsocket, R. I. The press, which is shown in the



Simplex Utility Press

illustration, is 60 in. high with a width of 21 in. between the frame members. The table, or work support, can be adjusted to five different heights. Pressure is obtained through a 4 P. .45 carbon steel screw, $1\frac{1}{16}$ in. diameter, which has a travel of 8 inches. Three different speeds and leverages are available, the lowest speed having a leverage of 4,000 to 1 with a pressure of 80,000 pounds. The leverages can be quickly changed to suit the work. A ratchet wheel mounted on ball bearings provides for ease and

EFFICIENCY—DEPENDABILITY



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Both Prime Factors Built in

POWER PUNCHING and SHEARING

Machinery Made By

THE LONG & ALLSTATTER CO.

HAMILTON, OHIO

A superior and more complete line than ever, for perforating and cutting off metal in practically any size or shape

STEEL PRESS BRAKES
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POWER PRESSES

CUT YOUR COSTS!

SMITH & MILLS

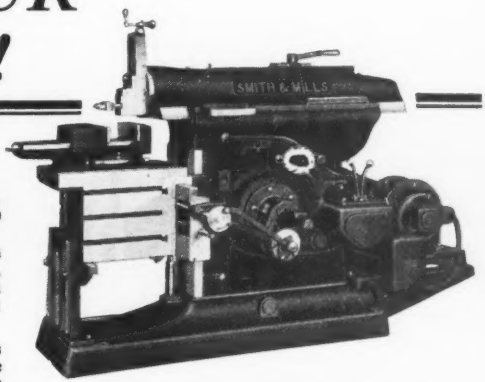
HIGH SPEED

CRANK SHAPERS

are designed for accurate work at high speeds. They shorten production time, which cuts your operating costs. Smith & Mills shapers are equally efficient on tool room or production work.

Smith & Mills modern improvements include "V" type ram with 55 degree ways, splined shafts, heat-treated alloy steel gears, speed box shafts mounted on Timken tapered roller bearings, Twin Disc Clutch, and one shot lubrication system.

WRITE FOR CATALOG!



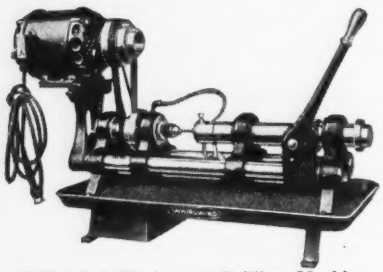
Made in 16, 20, 25 and 32-inch sizes back geared; single-geared in 12 and 14-inch stroke.

THE SMITH & MILLS CO., Cincinnati, Ohio

speed in adjusting the plunger to the work. Equipment includes two combination blocks which are used as parallels, straightening V's, and bending dies; V-nose for straightening and bending; one plain nose, and one bar.

Whirlwind Horizontal Drilling Machine

The Whirlwind Products Co., 1739 Ludlow Avenue, Indianapolis, Ind., has developed a drilling machine of the horizontal type for bench use, as shown in the illustration. The machine is intended for use in small drilling, having a drill capacity of from No. 60 to ¼ inch. The work is held in a fixture that is mounted on the end of the ram, as shown, and is fed to the drill horizontally by a movement of the hand lever. Ample lubrication is provided by a belt driven gear pump which forces lubrication to the point of the drill.



Whirlwind Horizontal Drilling Machine

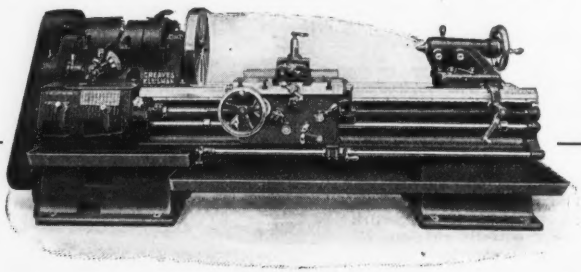
The diameter of the spindle is 1⅛ in. and any one of four speeds can be obtained—2,000, 4,000, 7,000 and 12,0 r.p.m. The ram is 2 in. diameter and has a stroke of 2 inches. The length of the machine is 36 in., width, 15 in. and height, 23 in. Space for jigs, 0 to 6 in. Power is supplied through a ½ h.p. 110-220 A.C. motor with 10 feet of cord ready to connect to lamp socket. Weight, uncrated, 250 pounds.

Wedge-Lock Tool Holder for Turret Lathe

A straight tool holder for holding tool bits in the square turret of a turret lathe has been placed on the market by the Wedge-Lock Tool Company, 2521 N. Keeler Avenue, Chicago, Ill. The holder which is shown in the illustration, holds rectangular bits parallel with the shank

INCREASE PRODUCTION WITH

G. K. SINGLE LEVER CONTROL



SEARCHING through several combinations of levers to obtain the correct spindle speed **holds down production.** But not with G. K. Single Lever Control Lathes.

Any speed of an extremely wide range can be instantly selected through only one lever. An index plate simplifies the operation still further — it tells at a glance how to obtain the desired speed.

Simplified Operation speeds up production. The G. K. Catalog describes many more features which also speed up production. Send for your copy today.

The Greaves-Klusman Tool Co., Cincinnati, Ohio

Stuart Oils

FOR THE "TOUGHEST" METAL WORKING CONDITIONS

WHY DELAY

In Trying This

Genuine Development

Stuart's CODOL

LIQUID GRINDING COMPOUND

(TRANSPARENT)

COMPARED with the soluble cutting oils sometimes used for grinding and with the paste grinding compounds of the old type, this basically new and different material offers the means for securing entirely new standards of grinding efficiency.

Your delay in getting acquainted with this thoroughly tested development means a mutual loss. Order trial 5-gal. can, or 15-gal., 30-gal. or 55-gal. steel drum (with faucet) from nearest office and warehouse on basis of 100% satisfaction or 100% credit.

BOSTON	PHILADELPHIA
BUFFALO	PITTSBURGH
CLEVELAND	ST. LOUIS
DETROIT	SAN FRANCISCO
LOS ANGELES	SEATTLE
NEW HAVEN	TORONTO

D.A. STUART & CO. LIMITED

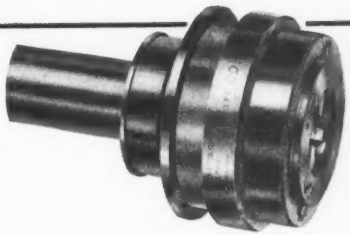
CHICAGO. U.S.A.

Warehouses in Principal Centers

Precision Threads

—WITH—

MURCHEY TOOLS!



IT'S not an easy job to do precision threading in large production lots with the ordinary type of threading tool. **But MURCHEY tools are not ordinary tools.** They are especially designed to enable the fastest equipment to do precision work at top speeds.

Take, for instance, the type C-O self-opening die head illustrated above. This tool is used particularly on automatic screw machines where the die head is revolved. The outstanding feature of the type C-O die head is the collar trip which automatically opens instantly when the desired depth of thread is reached.

Try a MURCHEY Tool on your work —we'll be glad to send one on approval. There is no obligation.

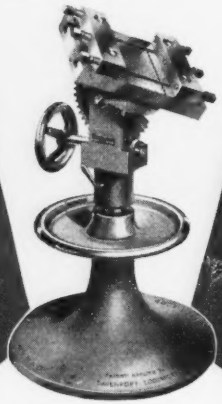
—MURCHEY—

MACHINE & TOOL CO.

951 PORTER STREET

DETROIT MICHIGAN

Make That Extra Floor Space Pay a Profit



"What extra floor space?"—you may ask—"Our die shop is too crowded now." But there *will* be plenty of extra floor space when you replace those sprawling work benches with Davenport Universal Die Holding Stands. With these new stands, two men can work where only one worked before—with plenty of room for everyone.

And that isn't all. The work goes faster because the die can be raised, lowered or tilted to any angle with finger tip ease. Davenport Universal Stands are built in two sizes—for handling die blocks up to 3,000 lbs. weight. Write for illustrated folder.

Davenport Locomotive & Mfg. Corp., Davenport, Iowa

Sold Exclusively By

THE WESSON SALES CO.

7338 Woodward Ave., Detroit, Mich.

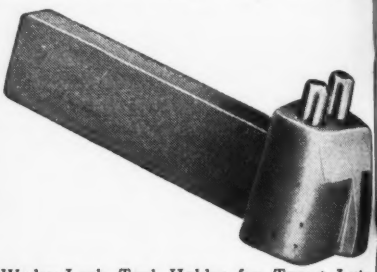
Representatives in All Large Cities

DAVENPORT

Universal

Die Holding Stand

the bits being held in place by the "Wedge-Lock" method. This method is positive and almost instantaneous in action, the bits being locked or released

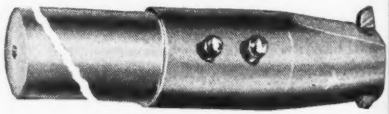


Wedge-Lock Tool Holder for Turret Lathe

by a tap on the locking or releasing pin thus reducing the time of changing tools to the minimum. The holder is particularly adaptable for holding tungsten carbide tools, due to the fact that the tool is held rigidly against the side of the tool slot and therefore cannot swing under the pressure of a heavy cut. If desired, four holders may be used in the tool post instead of four solid tools.

Wedge-Lock Boring Tool

The illustration shows a boring tool which has been placed on the market by the Wedge-Lock Tool Co., 2521 N. Keeler Avenue, Chicago, Ill. This tool incorporates the Wedge-Lock principle of holding toolbits, the bit being locked or released by a tap on the locking or re

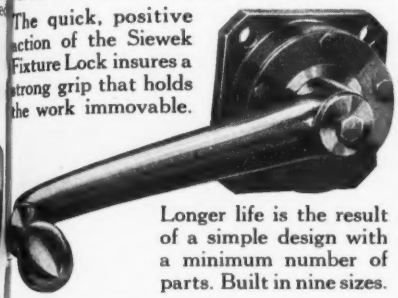


Wedge-Lock Boring Tool

leasing pin and thus reducing the time of changing tools to the minimum. Whereas the locking pins normally extend approximately an inch above the bar, however, the pins in this bar can be depressed and locked with the bits in place, so that the pins will be flush with the body and will thus allow the bar to enter the hole without hindrance. This feature is very desirable on a boring bar. The bars are of forged steel, with shanks either round for turret lathes or rectangular for use in engine lathes, and are made in four sizes.

Siewek Fixture Locks

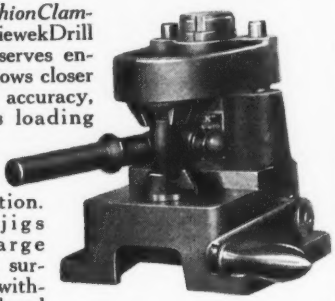
The quick, positive action of the Siewek Fixture Lock insures a strong grip that holds the work immovable.



Longer life is the result of a simple design with a minimum number of parts. Built in nine sizes.

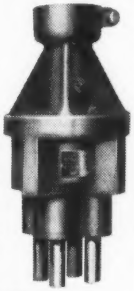
Siewek Drill Jigs

The *Cushion Clamping* of Siewek Drill Jigs conserves energy, allows closer drilling accuracy, reduces loading time, and increases production. These jigs have large wearing surfaces to withstand hard usage and to maintain their accuracy. It is built in eight types.



Siewek Drill Heads

Siewek Drill Heads, when used in combination with Siewek Drill Jigs, insure a tool set-up that will give maximum production over a long period of time. There is a Siewek Drill Head to meet every requirement.



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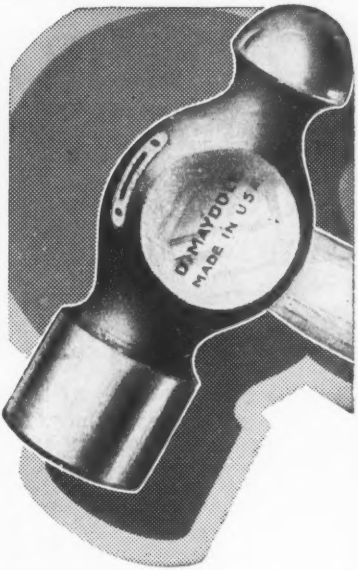
Siewek Tool Co.

DETROIT MICHIGAN



Built to stand hard use . . .

YOU'VE got a right to expect a lot from a Maydole Hammer . . . and you'll get it because it's made for the man who gives a hammer the hardest kind of use.

Press-forged tool steel head, clear second growth hickory handles . . . put together with a "hang" that has never been equalled. Your dealer carries them, send for a free copy of Pocket Handbook 23 "P" containing much valuable information.

YOUR HAMMER SINCE 1843

Maydole Hammers

The David Maydole Hammer Co., Norwich, N.Y.

3637

The PULLMORE Industrial Clutch

is dependable

PULLING heavy loads—year in and year out—with a minimum number of adjustments, is the kind of service you get from the PULLMORE Industrial Clutch, accounting for its use on prominent equipment as follows:

Leading manufacturers of Lathes, Laundry Machinery, Drilling and Boring Machines, Snow Plows, Milling Machines, Testing Machines, Fire Fighting Equipment, Grinding Machines, Cranes, Rubber Working Machinery, and many others.

You can solve your transmission problems with the PULLMORE Clutch. Let us show you how. Just send us the details of your requirements.

Be sure you get the PULLMORE Catalog—send the coupon TODAY!

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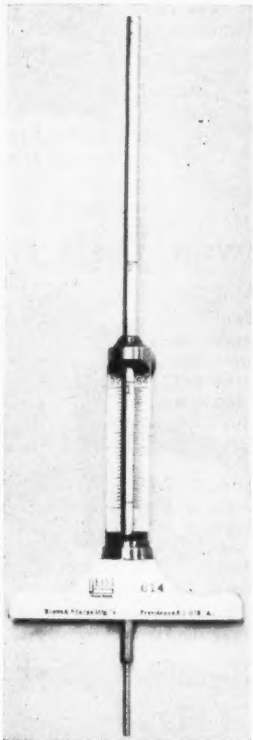
ROCKFORD DRILLING MACHINE CO.
Rockford, Ill.
Send me a copy of the PULLMORE Industrial Clutch Catalog.
Name..... Title.....
Firm .....
Address .....
City .....State.....
MMS-3

B. & S. No. 614 Depth Gage

The Brown & Sharpe Mfg. Co., Providence, R. I., has announced an addition to its line in the form of a graduated rod depth gage with which the depths of holes of any size can be quickly measured. The base is 2 in. wide and the rod is 6 in. long, the first 3 in. being graduated in 64ths of an inch. The first $\frac{5}{8}$ in. of the rod is $\frac{1}{16}$ in. diameter and the remainder is $\frac{1}{8}$ in. diameter. The wide base and slender rod make this tool particularly convenient for measuring holes of either large or small diameter.



B. & S. No. 614 Depth Gage

New "F Type Landmatic"

The Landis Machine Company, Waynesboro, Pa., has designed and placed on the market the new "F Type

Exchange your old cutters for new ones!

"Say, Jim, how would you like to exchange these old worn out cutters for new ones? You can, by merely having them reclaimed by the National Tool Salvage method. Besides getting a cutter that is as good as new, you can reduce your tool costs 20% to 50%. You can't beat that."

"No, John, I don't suppose I can beat that, but will they be as good as new tools?"

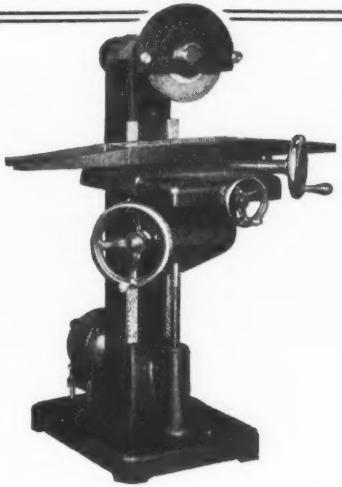
"Sure they will, Jim. The teeth are recut and the clearance restored by this method without impairing the quality or temper of the steel. Each recut tool is guaranteed the same as any new tool."

Jim was a bit skeptical, but a trial convinced him. A trial will also convince you of the economy of this method. Send us a few of your worn out cutters. Let us recut them and then test the reclaimed cutter on your own work. You won't be disappointed!

National Tool Salvage Co.

3840 Beaubien St. Detroit, Mich.

GRAND RAPIDS No. 1 SURFACE GRINDER



THE GRAND RAPIDS No. 1 Surface Grinder is an ideal machine for those odd jobs that are constantly coming up in the tool room. It is a fast machine, which can be easily changed from one set up to another, particularly suited for grinding small work where short longitudinal table strokes are required.

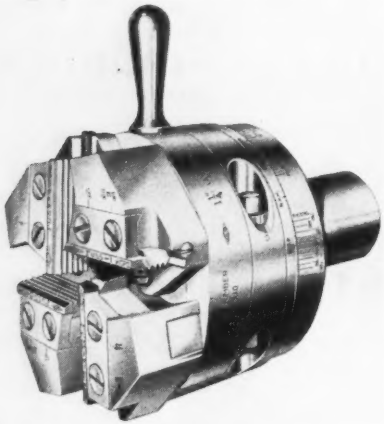
A competent operator can exceed the production possibilities of anything in the automatic surface grinder line, except the latest type of hydraulic feed machines.

Investigate this grinder—you'll find it is a high grade hand feed precision machine. Send for a catalog TODAY!

GALLMEYER & LIVINGSTON CO.

348 Straight Ave., Grand Rapids, Mich.

Landmatic" die head for application to turret lathes and hand operated screw machines. This tool is intended to pro-



New "F Type Landmatic"

duce full and correct threads when the stock runs out of line by floating or flexing on the shank, which allows it to center itself around the center of the stock. This flexible condition is controlled by two heavy springs which always return the head to the central position upon release from the stock.

The locking mechanism, entirely independent of the shank, floats with the head proper. The driving torque is transmitted directly from the shank to the head body and is also independent of the rest of the head.

Alliance Adjustable Angle Plate

An angle plate which can be adjusted to 180 degrees and is therefore particularly adaptable for use in laying out work, tool room checking, or for performing light machine operations, has been placed on the market by the Alliance Tool Company, Alliance, Ohio. The work can be presented at any angle within the 180-degree range without releasing the clamping. The plate is made in two sizes, both of which are provided with T-slots for clamping. The 8 x 12-in. size is provided with two key slots in the base at right angles, which

Nielsen Live Centers

Stand the "GAFF"!

THE stamina of NIELSEN Live Centers has been proven in a recent demonstration of tungsten carbide cutting tools at the Case School of Applied Science.

A standard No. 6 NIELSEN Live Center was placed on a turret lathe equipped with a tungsten carbide cutting tool. A cut 5/8" deep with a feed of .037" per revolution was taken in cast iron at a cutting speed of 500 surface feet per minute.

Next steel with an analysis of .50 carbon, .75 chrome and 1½% nickel was turned. A cut ¼" deep with .037 feed per revolution was taken at a cutting speed of 200 feet per minute. The center stood up under this cutting load without chatter and showed no sign of breaking down or burning.

There is a NIELSEN Live Center for every center requirement — write for bulletin

NIELSEN, INC.
LAWTON, MICHIGAN

Drill Around Corners

WITH A

Koza Right Angle Drill

WHEN it is necessary to put in a hole or drill out a broken bolt in a hard-to-get-at-place — a Koza Right Angle Drill or Grinder will prove itself worth its weight in gold.

Koza Right Angle Drills and Grinders eliminate the necessity of tearing down a machine, to reach the broken bolt or part, by drilling around the corner — at right angles.

These tools may be used for drilling, keywaying or countersinking. There is a tool for every requirement—in every industry.

Write for Bulletin

CHAS. A. KOZA

464 AUGUSTINE STREET
ROCHESTER, N. Y.

Boiler Clamps

Electric Steel Deep Throat, Medium Weight.

Made in three sizes.

Openings from 2½ to 6 inches

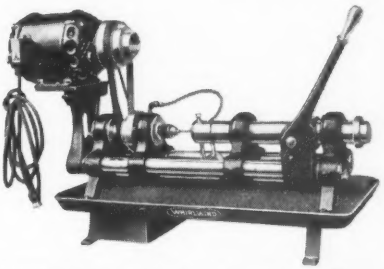
Send for catalogue No. 80, showing other types and Lathe Dogs and Expanding Mandrels, etc.

W. G. LECOUNT TOOL WORKS
SOUTH NORWALK, CONN.

Whirlwind

HORIZONTAL DRILLING MACHINES

Increase Production— Lower Cost



Drill *More* Holes in *Less* Time

YOU will be surprised how much faster you can do PRODUCTION Drilling with a WHIRLWIND HORIZONTAL Drilling Machine. Its horizontal construction permits faster loading of parts to be drilled, while the reverse movement of the feed lever AUTOMATICALLY ejects the finished work.

This machine will increase drilling production 50 to 100% over that of a vertical drill press. It is adaptable to practically all small drilling and reduces to the minimum the expense of resharpening and replacing drills. All these facts have been proven in many of the country's largest production shops.

If you'll send us one of your drill problems we'll gladly tell you how many pieces per hour we will guarantee the WHIRLWIND to drill.

No Obligation, Of Course

WHIRLWIND PRODUCTS CO.

1737 Ludlow Street, Indianapolis, Ind.

NEW

— A —

TOOL HOLDER

— FOR —

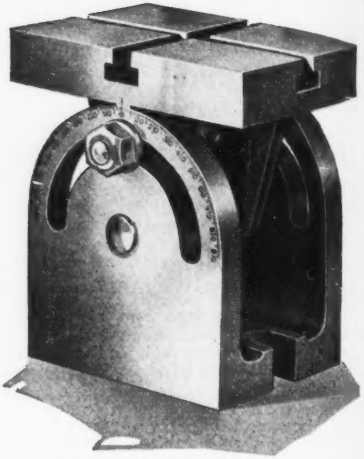
TURRET LATHES

More Economical—
More Pieces Per Set-Up—
No Side Play—

Sold by Jobbers Everywhere

CIRCULAR UPON REQUEST

WEDGE-LOCK TOOL CO.
2523 N. Keeler Ave. CHICAGO

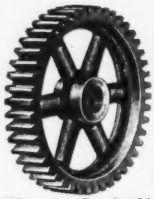


Alliance Adjustable Angle Plate

is convenient when a milling operation is to be performed where it is desired to use only one slot for clamping.

Improvements On Cincinnati Plain Self-Contained Grinder

A number of improvements which have been made on the Cincinnati Plain Self-Contained grinder are described and illustrated in a bulletin which has been issued by Cincinnati Grinders, Inc., Cincinnati, Ohio. The improvements include continuous pressure feed lubrication to the table ways, extra heavy spindle with capacity to carry a wheel up to 10 in. in width, silent chain or Texrope drive, heat treated sliding gears for table traverse speed changes, multiple speed worm drive self-contained headstock, centralized control, and a 30-in. diameter grinding wheel.



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In Stock . . .
Immediate Delivery
Gears, speed reducers, sprockets, thrust bearings, flexible couplings, pulleys, etc. A complete line is carried in our Chicago stock. Can also quote on special gears of any kind Send us your blue prints and inquiries.

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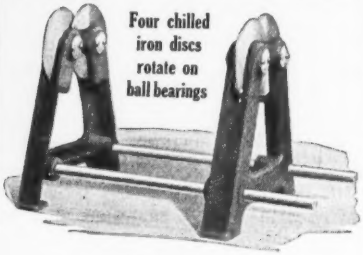
CHICAGO GEAR WORKS
769-773 W. Jackson Blvd. Chicago, Ill.

Anderson Improved
Balancing Ways
No Leveling Required

A simple and excellent device for balancing, straightening and trueing.

They are made in the following sizes:

Swing	Greatest Distance Between Standards	Capacity in Lbs.
20 in.	20 in.	1,000
40 in.	30 in.	2,000
60 in.	30 in.	2,000
72 in.	66 in.	5,000
96 in.	88 in.	10,000



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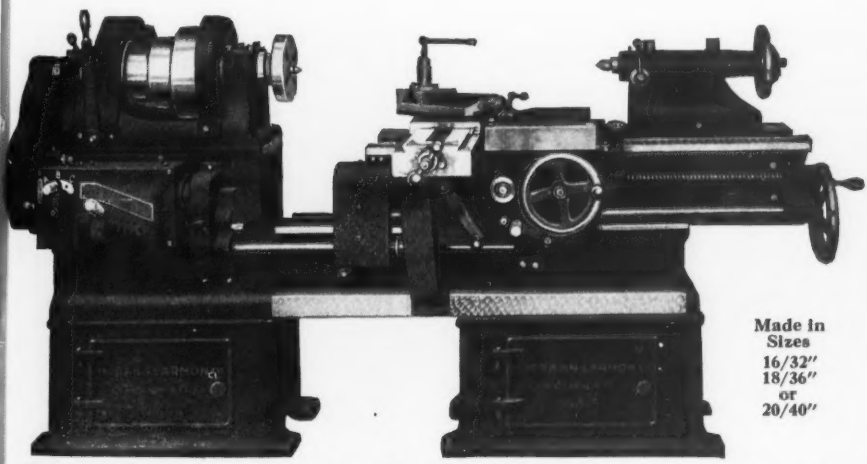
Mfd. By **Anderson Bros. Mfg. Co.**
1926 Kishwaukee Street, Rockford, Ill.

MACHINISTS AND TOOL-MAKERS TOOL CHESTS

Tool Chests that are right in construction and price.

Send for No. 25 Catalogue of Tool Chests and Tools.

WATERSTON'S
420 Woodward Avenue
DETROIT, MICH.



Made in Sizes
16/32″
18/36″
or
20/40″

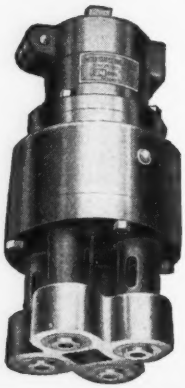
Rahn-Larmon 18/36″ Extension Bed Gap Lathe

A lathe for large or small swing work, ready at all times. Requires no extra rigging up. Takes different distances between centers.

Belt driven or with nine speed all geared motor driven head. Tell us what your requirements are and let us quote you.

THE RAHN-LARMON CO. 2935 Spring Grove Ave., Cincinnati, Ohio

Speed Up
DRILLING OPERATIONS
with a



U.S. Drill Head

WITH this simple attachment on your one-hole-at-a-time drilling machine, you can drill two, six, a dozen, or fifty holes, if necessary, in the same time it takes to drill one.

The drill head shown above is a single purpose tool for drilling four holes at one time. It is a fixed spindle multiple head, but we also make adjustable spindle multiple heads, which can be used on a variety of jobs. What is your problem? We will design a U. S. Multiple Drill Head to meet your particular needs. Send us your blue print NOW.

***The* United States Drill Head Co.**

1954 Riverside Drive

CINCINNATI, O., U. S. A.

Distortions in Steels

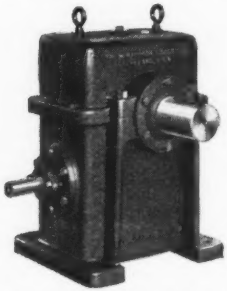
(*Continued from page* 34)

removed or broken at any point, the tension is relieved at this point and the newly-exposed surface is free to expand.

Hot rolled steels are not so liable to distortion, as they are not manipulated after cooling; all working of the steel is done while it is in a plastic state, and thus no strains are set up. Hot rolled steels are affected but little by machining, excepting when very heavy cuts are taken. However, the distortion produced by heavy cuts is usually not serious, and finishing cuts may be taken without further distortion.

It is not to be assumed that hot rolled steels should always be used on all classes of work; cold rolled steels will always hold favor, due to the free cutting qualities and to the kind of finish that can be produced.

SPEED REDUCERS



1/16 H.P. up to 200 H.P. Any ratio you desire in standard size units.
Send for Catalog.

We also manufacture a complete line of industrial gears.

The HORSBURGH & SCOTT Co.
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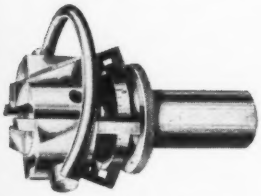
Adjustable Hollow-Mill High-Speed Blades



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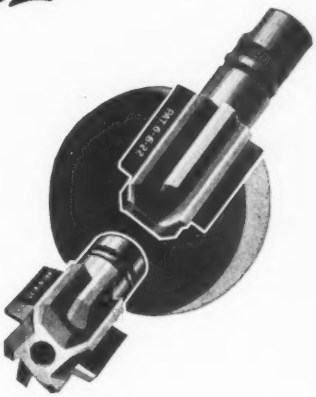

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(Continued from page 50)

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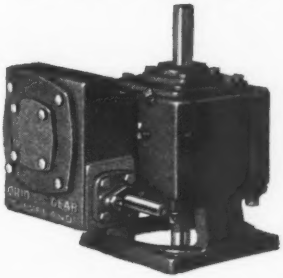

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Hollow-Milling: How production can be increased and costs lowered by the use of adjustable hollow-mills with high speed blades and interchangeable shanks is told in a bulletin that has been issued by Ogden R. Adams, 407 Cutler Bldg., Rochester, N. Y. Copy free upon request.

Aetna Thrust Ball Bearings: Catalog No. 8, published by the Aetna Ball Bearing Manfg. Co., 4610 Schubert Ave., Chicago, Ill., contains complete descriptions and illustrations of the thrust ball retainers made by this firm. Copy free upon request.

Broaching By Modern Methods: Equipment and tools for finishing round, square or irregular-shaped holes and surfaces by broaching are described and illustrated in a booklet that is issued free by the American Broach & Machine Co., Ann Arbor, Michigan.

Ames Dial Gages: The latest types of dial gages for inspection purposes are described in the Ames No. 55 Bulletin, which will be sent free to any machine shop executive. Address B. C. Ames Co., Waltham, Mass.

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Stop Tap Breakage: A booklet that tells how to stop the breakage of taps, reamers, and other tools, by the use of a friction chuck, also how to use the chuck for setting studs or nuts, has been issued by The Apex Machine Co., 200 Davis Ave., Dayton, Ohio. Sent free upon request.

Machine Shop Accessories: Catalog B-27, issued by the Armstrong Bros. Tool Co., 328 N. Francisco Ave., Chicago, Ill., describes the line of tool holders, boring tools, wrenches, pipe tools, ratchet drills, lathe dogs, and other tools manufactured by this company.

Hobs and Milling Cutters: A complete line of milling cutters and hobs for cutting all kinds of gears, splines, sprockets and other forms is described in Catalog G, issued by the Barber-Colman Company, Rockford, Ill. Descriptions and illustrations of the Barber-Colman hobbing machine and hob-sharpening machines are included. Sent free on request.

All-Geared Drilling and Tapping Machines: A catalog describing in detail the various types of all-geared, self-oiling, drilling and tapping machines made by the Barnes Drill Co., 801-851 Chestnut Street, Rockford, Ill., will be sent free upon request.

Modern Drilling Equipment: Circulars describing the various types and sizes of Barnes upright drills, multiple drills and horizontal drilling machines made by this company have been issued by the W. F. & John Barnes Co., Rockford, Ill.

Automatic Oiled Die Sets: The automatic oiled die sets, die shoes, punch holders, leader pins, bolster plates, bushings, and other standard die parts made by the E. A. Baumbach Manfg. Co., 1806 S. Kilbourn Ave., Chicago, Ill., are described in Catalog No. 5, which has been issued by that company. Sent free upon request.

"C-V" Chrome Vanadium Wrenches: A complete line of wrenches made of Chrome Vanadium steel—practically unbreakable—is described in a booklet that has been issued by the Bonney Forge & Tool Works, Allentown, Pa. Copy free upon request.

Bradford Precision Lathes: Precision Lathes for the tool room and for general manufacturing purposes, all-geared and cone types, belt or motor driven, are described and illustrated in a catalog that is issued by The Bradford Machine Tool Co., 657-671 Evans St., Cincinnati, Ohio. The catalog also includes descriptions of taper, relieving, turret and other lathe attachments. Sent free upon request.

How To Sharpen Staggered Tooth Cutters, Helical Milling Cutters, and Two-Lipped End Mills: A series of pamphlets on these subjects can be obtained without charge by addressing the Brown & Sharpe Mfg. Co., Providence, R. I.

High Speed Drill Presses: A complete line of drill presses that can be run at high speeds with complete safety is described in catalog number 50, issued by the Canedy-Otto Manufacturing Company, Chicago Heights, Ill. This catalog also contains descriptions of other equipment manufactured by this concern. Sent free upon request.

Gears Of All Kinds are described and illustrated, with specifications, in Catalog 80, which has been issued by the Chicago Gear Works, 105-9 S. Jefferson St., Chicago, Ill.

Electric Tools: The complete line of "The Cincinnati" Electric Drills, Grinders, Buffers, etc., manufactured by the Cincinnati Electrical Tool Company, Cincinnati, Ohio, is fully described and illustrated in their new catalog. Free upon request.

Gear Data: The Cincinnati Gear Co., Cincinnati, Ohio, has published Catalog D, which describes and illustrates the various types and kinds of gears made by this firm. The book contains photographs of the plant departments, with descriptions of the equipment employed, and also includes a number of pages of valuable data and reference tables for machine shop use.

Grinding the Centerless Way: The advantages of the centerless grinding method is discussed in a booklet which also describes the centerless grinding machines made by Cincinnati Grinders, Inc., Cincinnati, Ohio. The illustrations show various types of jobs in process, and full data is included. Copy free upon request.

Rapid Traverse Planers: Cincinnati Hypro Planers, made by the Cincinnati Planer Co., Cincinnati, Ohio, are described in a new catalog that has been issued by this company.

Handbook For Drillers: The Cleveland Twist Drill Co., 1242 E. Forty-ninth St., Cleveland, Ohio, has published a book in which the various parts of the twist drill are described, and which tells how to grind a drill correctly. The troubles that result from incorrect grinding are described and illustrated and several chapters are devoted to the subjects of speeds, feeds, materials, cutting compounds, and so on. Sent free upon request.

Columbia Superior Shapers: Bulletin No. 17, issued by The Columbia Machine Tool Co., Hamilton, Ohio, describes and illustrates the line of heavy duty shapers made by this firm. Copy free upon request.

Columbia Tool Steel Handbook: A book containing valuable information concerning the making of tools, heat treating, uses of hardness testing instruments, uses of the quenching bath, drawing bath, and other heat treating equipment, and together with tables and other useful information can be obtained without charge by addressing the Columbia Tool Steel Co., 550 E. 14th St., Chicago Heights, Ill.

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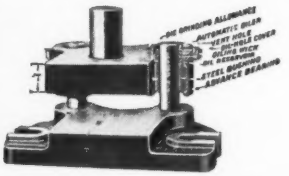

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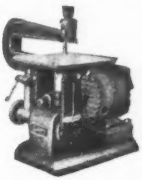

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Make Better Dies: Better work can be produced, and in less time, if the die can be held in the most convenient position. A universal die-holding stand which can be quickly adjusted to hold a die at any height or angle is described in a catalog which can be obtained by addressing Davenport Locomotive & Mfg. Corpn., Dept. M, Davenport, Iowa.

Davis Keyseaters: Recent developments in keyseating methods are discussed in a bulletin that also describes the keyseaters made by the Davis Keyseater Company, 250 Mill St., Rochester, N. Y. Copy free upon request.

Grinding Wheel Dressers: All of the different types of grinding wheel dressers made by the Desmond-Stephan Mfg. Co., Urbana, Ohio, including Desmond-Huntington, Desmond-Sherman, Zig-Zag, Diamo-Carbo, and diamond dressers, are described and illustrated in a catalog that has been published by the firm mentioned. Free upon request.

Quantity Drilling: A semi-automatic multiple spindle drilling machine which is designed to produce the maximum of drilled holes in medium or small parts, is described in a pamphlet that is published by the Detroit Machine Tool Co., 5055 Woodward Ave., Detroit, Michigan. Sent free upon request.

Precision Grinding: A booklet which describes and illustrates the most modern methods of performing all kinds of precision grinding operations, showing how the Dumore grinder can be applied to various kinds of machine tools, has been published by The Dumore Company, Racine, Wis. Copy free upon request.

Interchangeable High Production Tools: Catalog No. 28, issued free by the Eclipse Counterbore Co., 7410 St. Aubin St., Detroit, Mich., describes and illustrates the interchangeable counterbores, spot facers, end form cutters, and other end cutting tools made by this firm.

Economy in the Drafting Room: A drafting table which can be adjusted, by means of a foot-lever, to any height or angle most convenient, is described in a folder that can be obtained without charge by addressing the Equipment and Supply Company, 51 Madison Avenue, New York.

Precision Measuring Instruments: The latest types and models of dial indicators, thread lead test gages, pitch gages, thickness gages, dial comparators, and other precision measuring instruments marketed by the Federal Products Corporation, Providence, R. I., are described and illustrated in a book that will be sent free upon application to this firm.

Gear Tooth Shapes: A study of the fundamental principles of involute gearing and treatise on the development of the standard tooth form are contained in "Gear Tooth Shapes," published by The Fellows Gear Shaper Co., 78 River St., Springfield, Vt. Copy free upon request.

Questions To Ask Before Buying a Jig-Boring Machine: A list of the fine points to look for in a jig-boring machine, with descriptions and illustrations of the working parts of the Swiss Jig Borer, can be obtained free by addressing The R. Y. Ferner Co., 1511 K St., N. W., Washington, D. C.

Production of Metal Stampings: The Ferracute Machine Co., Bridgeton, N. J., is publishing a booklet which describes and illustrates the most modern equipment for the production of metal stampings. Copy free upon request.

Silent, Self-Lubricating Gears for use in all kinds of machines are described in a booklet that can be had upon application to Fibroc Insulation Company, Valparaiso, Indiana.

Formica Silent Composition Gears: A booklet telling about the uses and advantages of Formica Silent Shock Absorbing Gears, and containing a considerable amount of valuable data with rules and tables for laying out, cutting and using gears. Sent free by Formica Insulation Co., 4632 Spring Grove Avenue, Cincinnati, Ohio.

Fosdick Drills: This publication gives details as to the design and construction of Fosdick Radial, Upright, and Sensitive Drills. Published by the Fosdick Machine Tool Co., Cincinnati, Ohio.

"Non-Clog" Coolant Pumps are described and illustrated in a booklet which has been issued by the Fulflo Specialties Co., Blanchester, Ohio. Copy free upon request.

Modern Grinding Equipment: The complete line of universal tool and cutter grinders, surface grinders, drill grinders, tap grinders, and other grinding machines made by the Gallmeyer & Livingston Co., 336 Straight St., S. W., Grand Rapids, Michigan, is described in a series of bulletins that have been issued by this firm. Free upon request.

Flat Surface Grinding: Automatic, semi-automatic, and single-purpose machines for performing all kinds of grinding operations on flat surfaces are described and illustrated in a book that has been issued by the Gardner Machine Company, Beloit, Wis. Copy free upon application.

Adjustable Blade Cutters: Hollow mills, facing tools, face mills, milling cutters and other production tools with adjustable, interchangeable blades are described and illustrated in a booklet that is issued free by the Cincinnati Manufacturing Co., 141 N. Water St., Rochester, N. Y.

Greaves-Klusman Lathes: A book containing complete descriptions of the latest types of lathes made by this firm has been issued by the Greaves-Klusman Tool Co., Oakley, Cincinnati, Ohio.

Swiss Files: The complete line of Grobet Swiss Files for use in die and tool work or for other fine work is described and illustrated in Catalog "K," published by the Grobet File Corporation of America, 3 Park Place, New York, N. Y. Copy free upon request.

Grinding, Polishing and Buffing Machines of the latest types are described and illustrated in a series of bulletins that have been issued by the Hammond Machine Builders, Kalamazoo, Mich. Copies free upon request.

Air Is Your Best Helper: Air will operate your presses, chucks, vise jaws, and other tools more efficiently and at less cost. Catalog MS-11, issued by the Hannifin Mfg. Co., 621-631 S. Kolmar Ave., Chicago, Ill., will show you how it is done. Ask for a copy.

Drilling and Grinding Electrically: Catalog M, showing and describing a variety of modern electric portable drills, grinders, and other tools, including floor grinders and buffers, has been issued by The Hisey-Wolf Machine Co., Colerain and Marshall Sts., Cincinnati, Ohio.

Speed Reducers: A catalog of speed reducers from $\frac{1}{10}$ h. p. up to 200 h. p. and built to deliver any ratio desired in standard size units can be obtained without charge by addressing The Horsburgh & Scott Co., 5110 Hamilton Ave., Cleveland, Ohio.

"Excel" Precision Filing and Sawing Machine: A filing and sawing machine for use in producing templets, dies and other irregular-shaped parts is described and illustrated in a booklet which is issued free by the Index Machinery Corporation, 49 Central Ave., Cincinnati, Ohio.

"Do It Electrically": The complete line of "Thor" universal electric tools, including tools for drilling, reaming, screw-driving, tapping, nut-setting, grinding, and for performing other operations is described in Catalog No. 17, issued free by the Independent Pneumatic Tool Co., 236 S. Jefferson St., Chicago, Ill.

Tool Steel Composition, Selection, and Heat Treatment: William Jessop & Sons, Inc., 121 Varick St., New York, N. Y., has published a series of pamphlets dealing with the above subjects. Copies free upon request.

Special Mil-Waukee-Mils of Standard Units: A milling machine of which the base, heads, columns, and other parts are built in standard units, thus enabling the user to order a machine that will be especially adapted for his job, is described and illustrated in Catalog No. 36, issued by the Kearney & Trecker Corporation, Milwaukee, Wis. Free to machine shop executives.

Koebel-Wagner Diamonds for Wheel Dressing: The Koebel-Wagner method of mounting diamonds and the use of the "Dykon" gage are discussed in a bulletin issued by the Koebel-Wagner Corporation, 144 Orange St., Newark, N. J. Free upon request.

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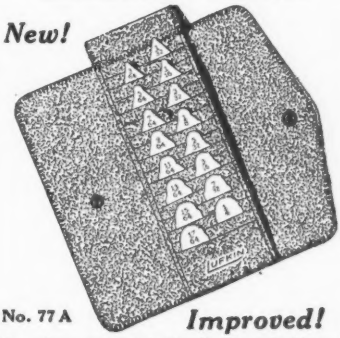

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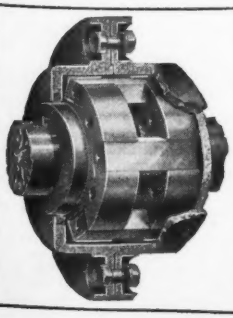

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Lathe Dogs and C Clamps are described and illustrated in Catalog No. 80, issued by the W. G. LeCount Tool Works, South Norwalk, Conn. Copy free upon request.

Air-Operated Work-Holding Devices: A booklet showing how air-operated chucks and devices of various kinds can be applied to different kinds of machines to save time and labor has been issued by The Logansport Machine Co., Logansport, Ind.

Punching and Shearing Operations: A complete line of machines for perforating and cutting metal in practically any size and shape is described and illustrated in a booklet which has been issued by The Long & Allstatter Co., Hamilton, Ohio. Copy free upon request.

Rapid-Reading Micrometer: A new type of rapid-reading micrometer, designed to show the reading in numerals, is described in Catalog No. 5, issued by The Lufkin Rule Co., Saginaw, Michigan. The catalog also contains descriptions of the micrometers, calipers, gauges, scales, squares, bevel protractors, and other tools made by this company. Free upon request.

Maydole Hammers: All the various types and kinds of hammers made by this 87-year-old firm are described and illustrated in a catalog which can be had without charge. Address The David Maydole Hammer Co., Norwich, N. Y.

Time Saving Machine Equipment: How machining time can be reduced to the minimum by the use of Wizard chucks, collets and tap holders, turret tool posts, self-centering steadyrests, and other McCrosky equipment is told in a book that is issued by the McCrosky Tool Corporation, Meadville, Penna. Will be sent without charge.

Hi-Production Counterbores: A counterbore of simple yet highly efficient construction, with positive drive, rigidity, and a number of other features is described in a circular which will be sent free upon request. Address Morse Counterbore & Tool Co., 12281 Turner Ave., Detroit, Mich.

Automatic Tapping and Threading Tools of the latest types and designs are illustrated and described in Catalog No. 25, which has been issued by the Murchey Machine & Tool Co., 951 Porter St., Detroit, Mich. Copy free upon request.

Natco Drilling, Tapping, and Boring Equipment is the title of a publication that has been issued by The National Automatic Tool Co., Richmond, Ind. The book gives details as to construction and uses of "Natco" multiple drilling and tapping machines.

Milling Internal Keyways: A simple method of milling keyways in gears, wheel hubs, and other similar parts with the aid of a drill press and a special tool is explained in a booklet that is published by the National Machine Tool Co., 2271 Spring Grove Ave., Cincinnati, Ohio.

Double Your Cutter Service: Milling cutters, reamers, and other tools can be recut at a saving of from 20 to 60 per cent by the National Tool Salvage Co., 3840 Beaubien St., Detroit, Mich. Circular upon request.

Save Time with Expanding Mandrels: How expanding mandrels will solve the problem of turning pieces with odd-size holes, and will increase production on duplicate work, is told in a folder that will be sent free upon request by W. H. Nicholson & Son, 136 Oregon St., Wilkes-Barre, Pa.

Live Centers: The complete line of live centers manufactured by Nielsen, Inc., of Lawton, Mich., are fully described in a bulletin issued by this company. This bulletin is illustrated with photographs and blueprints of the Nielsen Center. Mailed free upon request.

Ball and Roller Bearing Data Sheets: A complete set of data sheets showing all the dimensions and loads at given speeds, and giving instructions for mounting precision ball bearing and Hoffmann roller bearings, can be obtained without charge by addressing the Norma-Hoffmann Bearings Corporation, Stamford, Conn.

How To Grind Cemented Tungsten Carbide: A booklet which describes and illustrates the correct methods of grinding tungsten carbide tools has been published by the Norton Company, Worcester, Mass. Copy free upon request.

Correct Cutter and Tool Grinding: Grinder Booklet "E," which is illustrated with 48 photographs, tells how to grind tools correctly and economically. It shows how a solid-backed cutting edge reduces cutter costs and increases production per grind. A copy will be sent free by addressing The Oesterlein Machine Company, 3301 Colerain Avenue, Cincinnati, O.

Speed Reducers: Speed Reducers to obtain any desired reduction up to 24,000 to 1 are described and illustrated in Catalog 29-A, issued by The Ohio Gear Co., 1335 East 179th St., Cleveland, O. Copy free upon request.

Die Making Machines: How dies, templates, gages, etc., can be sawed out, filed, and lapped easily and accurately on Oliver die making machines is fully described in a bulletin issued by the Oliver Instrument Company, 1430 Maumee Street, Adrian, Mich. Mailed upon request.

Self-Tapping Sheet Metal Screws: Screws which are threaded and hardened in such a manner as to enable them to cut their own threads as they are screwed into sheet metal assemblies are described in a folder which is published by the Parker-Kalon Corporation, 192-196 Varick St., New York City, N. Y. Sent free upon request.

"Turning With Tungsten Carbide" is the name of a book that has been issued by The Porter-Cable Machine Co., 300 Wolf St., Syracuse, N. Y. This book answers the most important questions as to the uses of this new cutting alloy, and also describes a new lathe which has been developed especially for use with tungsten carbide tools. Copy free upon application.

Powell "Blo-Gun" Air Valves: Air is faster and more efficient than a brush for cleaning machine tables. The use of the Powell Blo-Gun for this purpose is discussed in a catalog that can be obtained by addressing The Wm. Powell Co., Cincinnati, O.

Tapping Devices, Quick-Change Chucks, Stud-Setting Tools and Bench Tappers: A catalog describing the various types and kinds of tapping, drilling, and stud-setting devices manufactured by the Procunier Safety Chuck Company, 12 South Clinton Street, Chicago, Ill., can be obtained without charge by addressing this company. The catalog also tells the part that Procunier tools play in obtaining greater accuracy and less tap breakage.

"Ready-Made" Die Sets: 28 styles and 200 sizes of Producto "Ready-Made" Die Sets are described in Catalog No. 5, which has been issued by The Producto Machine Co., Bridgeport, Conn. Ask for a copy.

Engine, Turret, and Gap Lathes are described in a series of bulletins that have been issued by The Rahn-Larmon Co., 2935 Spring Grove Ave., Cincinnati, Ohio.

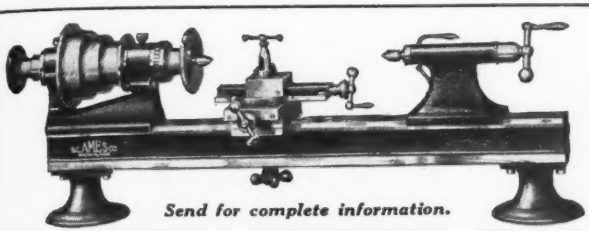
Pullmore Industrial Clutch: A multiple disc clutch, made in two types, to run in oil or dry, and which is so built that it can be operated at high speeds, is illustrated and described in a folder that will be sent free by the Rockford Drilling Machine Company, Rockford, Ill.

Universal Openside Shaper-Planer: The need of a machine tool to fill the gap between the shaper and the planer has been filled by the development of the Rockford Universal Openside Shaper-Planer, made by the Rockford Machine Tool Co., 2414 Kishwaukee Ave., Rockford, Ill. Full description on request.

Automatic Lubrication: Individually motor-driven pumps that keep the work flooded with lubricant are described in a booklet that has been published by the Ruthman Machinery Co., Front and Pike Sts., Cincinnati, Ohio.

Safety Grinding Wheels: The complete line of grinding wheels made by the Safety Grinding Wheel & Machine Co., Springfield, Ohio, is described in Catalog No. 11, which is issued by this firm. The book also contains instructions for operating grinding wheels, tables of grinding wheel speeds, pulley calculations, and other information for the user of grinding wheels.

Saving Time With Small Tools: A line of time-saving small tools, including "Use-'Em-Up" drill sleeve, "Wear-ever" chucks, collets, cutters, reamers and tap holders, counterbores, spotfacers, and other tools is described in Catalog 38, issued by Scully-Jones & Co., 1909 S. Rockwell St., Chicago, Ill.



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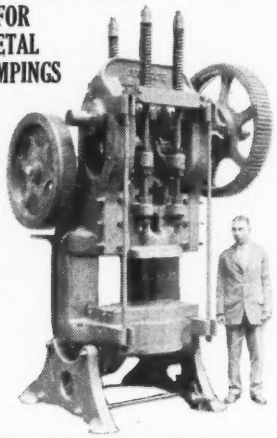

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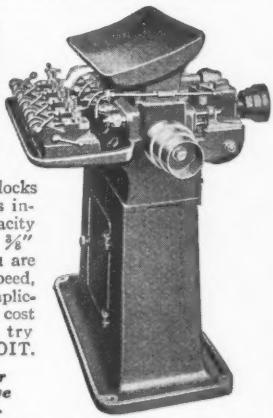

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Rapid Drill Jigs: How time can be saved and drilling operations made easier by the use of a quick-acting drill jig is told in a booklet that is issued free by the Siewek Tool & Die Co., 10230 Woodward Ave., Detroit, Michigan.

"Metal Cutting" is the title of the book that describes the latest methods of cutting metals, and includes descriptions and illustrations of both the band saws and inserted-tooth metal-cutting saws made by the Simonds Saws & Steel Co., Fitchburg, Mass. Copy will be sent free upon application to the firm mentioned.

80,000 Pounds Pressure By Hand: A new combination arbor, screw, and straightening press with which 80,000 pounds pressure can be obtained by hand is described and illustrated in a bulletin which can be had without charge by addressing the Simplex Tool Co., Woonsocket, Rhode Island.

Shaping with Modern Equipment: The Smith & Mills Company, 2889-91 Spring Grove Avenue, Cincinnati, Ohio, has issued a booklet which describes and illustrates the line of modern shaping equipment made by this firm. Copy free upon request.

Accurate Gages Speed Production: The complete line of snap, plug, ring, pin, dial indicator, and special gages made by the Standard Gage Co., Inc., Poughkeepsie, N. Y., is described and illustrated in Catalog No. 4, which can be had without charge by addressing this firm. Johansson gage block sets and accessories are also listed in this book.

Machinists' Tools and Gages: Catalog No. 24, issued by the L. S. Starrett Co., Athol, Mass., describes and illustrates the complete assortment of machinists' fine tools and gages made by this firm. Copy free upon request.

Engineering and Manufacturing Service: A complete engineering and manufacturing service for manufacturers who are not equipped to handle all of their own designing, experimental, or production work is described, with illustrations of the equipment available, in a bulletin that is issued by The Steel Products Engineering Co., Springfield, Ohio.

Flexible Shaft Equipment: The uses of the flexible shaft for drilling, grinding, and other operations is discussed in a booklet which also describes and illustrates the flexible shaft equipment made by N. A. Strand & Co., 5001 N. Lincoln St., Chicago, Ill.

Cutting Oil Data: A series of booklets containing valuable information about cutting oils and their uses for thread-cutting, broaching, and general cutting purposes will be sent free to any mechanical executive by D. A. Stuart & Co., 2727 South Troy St., Chicago, Illinois.

Rigidmilling Principles and Practice: A book that shows how the Rigidmil can be adapted to various kinds of usual and unusual milling operations, and which describes in detail the work that can be handled by this machine has been issued by the Sundstrand Machine Tool Co., Rockford, Ill. Copy free upon request.

Cutting and Grinding Facts: A discussion of cutting oils and lubricants, together with descriptions and illustrations of various kinds of jobs upon which cutting oils are used, is contained in a booklet that is issued by the Sun Oil Company, Finance Building, Pittsburgh, Pa. Free upon request.

Quality Drilling Machines: The high-grade drilling and tapping machines made by the Superior Machine Tool Co., P. O. Box 376, Kokomo, Ind., are described and illustrated in a booklet that will be sent free upon application to this firm.

Precision Measuring Instruments: The gages, micrometers, and other precision measuring instruments made by the Swedish Gage Co. of America, 7310 Woodward Ave., Detroit, Mich., are fully described in an interesting booklet that has been published by this firm. Copy free upon request.

Snap, Plug, Ring, and Thread Gages: The complete line of precision gages made by The Taft-Peirce Manufacturing Co., 32 Mechanic Ave., Woonsocket, R. I., is described in a folder which can be obtained, free, by addressing this company.

Save Cutting Oil: How cutting oil can be separated from chips and thus reclaimed by the use of a centrifugal chip "wringer," is told in a bulletin that is issued free by the Tolhurst Machine Works, Troy, N. Y.

Chuck With Air: How time and labor can be saved by the use of air-operated chucks, cylinders, and other equipment is told in a book which describes "Hopking" Air-Operated Equipment. Published by The Tomkins-Johnson Company, 620 N. Mechanic St., Jackson, Mich. Sent free upon request.

A Simplified and Improved Drive Control for Machinery: Two distinct types of plate clutches that have proved successful highly in the driving mechanism of machine tools are described and illustrated in a bulletin that will be sent free by the Twin Disc Clutch Company, Racine, Wis.

Powerful, Easy-Acting Chain Hoists of the most modern design are described and illustrated in a booklet that is issued by the Union Manufacturing Co., 296 Church St., New Britain, Conn. Copy free upon request.

Multiple Drilling With a Single-Spindle Drill: Methods by which multiple drilling may be done on a single-spindle drill, using multiple spindle drill heads, are discussed in a bulletin that is issued by The United States Drill Head Co., 1954 Riverside Drive, Cincinnati.

Electrically-Driven Portable Tools: The "U. S." line of electric drills, die grinders, electric screw drivers, surface grinders, tool post grinders, and bench and floor grinders is described in Catalog No. 24, which has been published by The United States Electrical Tool Co., 2471 W. Sixth St., Cincinnati, Ohio.

Eliminate Clamping Time: Work can be held without clamps on grinders, planers, and other machines by the use of Walker Magnetic Chucks that are described and illustrated in a series of folders that have been issued by the O. S. Walker Co., Inc., Rockdale St., Worcester, Mass. Copies free upon request.

Tool Chests for Machinists and Toolmakers: The complete line of fine tool chests for machinists and toolmakers made by J. M. Waterston, 420 Woodward Ave., Detroit, Mich., is described in Catalog No. 25. Ask for it.

"Wedge-Lock" Multiple Bit Tool Holder: A new type of tool holder, in which the tool bit is held by the action of a wedge, is described in a bulletin which will be sent free upon request by the Wedge-Lock Tool Co., 2521 N. Keeler Ave., Chicago, Ill.

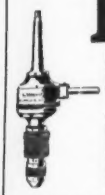
Shop Furniture: A catalog describing and illustrating all kinds of shop furniture, including benches, vises, steel stands, foremen's desks, chip trucks, steel racks for bar stock, steel tote boxes, and other equipment will be sent free upon application to The Western Tool & Manufacturing Co., 1620 East Pleasant Street, Springfield, Ohio.

Drill Horizontally: The advantages of the "Whirlwind" Horizontal Drilling Machine for high speed drilling on small work are discussed in a bulletin which has been issued by Whirlwind Products Co., 1737 Ludlow St., Indianapolis, Ind. Copy free upon request.

Wrenches For Every Use: "Guaranteed Against Breakage" tappet wrenches, pipe and fitting tongs, offset wrenches, and wrenches for all other uses are described and illustrated in a series of folders which can be obtained without charge by addressing J. H. Williams & Co., Buffalo, N. Y.

Hardness-Testing With Accuracy and Speed: The principles of testing for hardness by the use of the Rockwell Hardness Tester are discussed in a booklet which also shows a number of applications of this instrument, published by the Wilson-Maeulen Co., Concord Ave. and 143rd St., New York, N. Y. Sent free upon request.

TAPPING?



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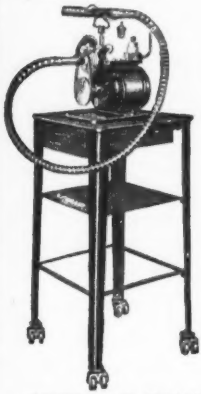

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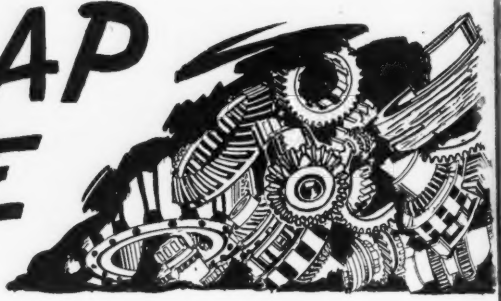

By GEO. ALEXANDER MANN

Great Stuff

The marriage game's good,
It sure is a whiz—
Wife dear cooks it up,
An' you guess what it is.

Another consistent guy is the sap who buys a suit 'cause it's guaranteed to wear like iron an' then belly-aches when after the first rain it looks rusty.

A Good Suggest

"For cat's sake," said Johnny Von Tipper,
To Doctor De Giblets, the ripper,
"For the sixth time, you rummy,
You've opened my tummy;
Why don't you jest put in a zipper?"

Some Toofins

With dad's tough teeth,
He cuts off hawsers—
Can't drink coffee,
He busts the saucers.

An' Yuh Never Will

The bar-room may o' been terrible—but yuh never heard of a man livin' to tell that he spent "Ten Nights In a Speak-Easy."

Paw says the difference between a married man and a single man is that a single man is nobody's fool.

Remember that the man with pull had plenty of push first.

Those who do for nobody are doomed to be nobody.

Police

Sodie Fountain Joe
Wed his mixer—
Where once he nectar
Now elixer.

Many a son's stock is worthless unless consideration is given to "pa" value.

The poor banks find it tuff sleddin'—every now and then they have to find two cashiers—a new one and the old one.

Why She's Quittin'

Liz the typist says,
The boss won't do at all—
He has a good face,
But his lap's too small.

Children are like parrots—it don't do to spend too much time tellin' 'em what not to say.

Sure Thing

"Will you love me as much
When we're married, dear Lest?"
An' Lest said, "Why sure—
I like married janes best."